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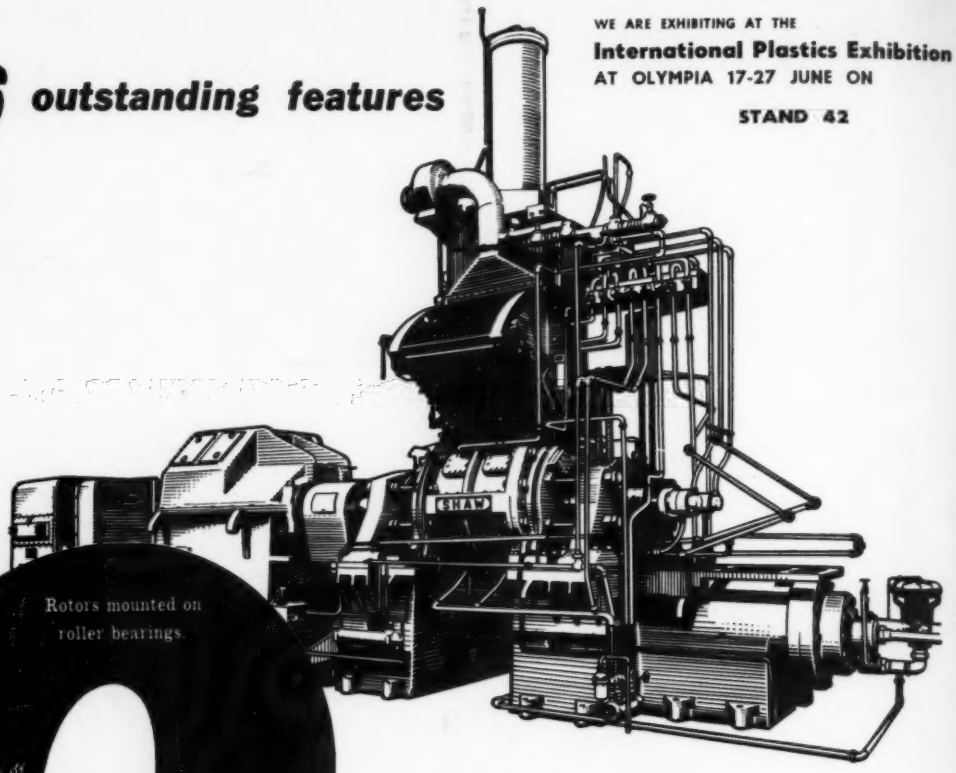

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Rubber Journal and International Plastics

Volume 136 **Price 1s. Post free 1s. 4d.** **No. 18**

IN ITS 75th YEAR

May 2 1959

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Grams : 'Buns, Souphone, London' Phone : HOP 5712
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NOTES of the WEEK

Rubber Grows

TWO developments announced last week underline the fact that the rubber industry, as Mr Frankenburg wrote in Monday's supplement to *The Times*, is indeed a 'growth industry.' Interestingly enough, and typical of many such in any expanding and virile industry, one of these developments will probably never come to the notice of the general public while the other bids fair to be quietly revolutionary and to have considerable popular appeal. The development of SP brown crepe (reported in last week's issue of *RJIP*) is not one that will stir public imagination but it is none the less of considerable importance. It means all-round improvement in the processing qualities of lower-grade natural rubber with consequent wider use in more and better end products. The development of a process for the direct moulding of microcellular soles and heels (reported elsewhere in this issue), while not having the spectacular appeal of, say, rubber developments connected with high-speed flight or space travel, is a tremendous technical achievement. It is a triumph of research by the same company which pioneered the direct-moulded resin rubber soles and heels, 25m pairs of which are made annually in the UK alone, and will probably have even greater success.

Ubiquitous Rubber

MENTION was made above to *The Times* supplement on the rubber industry. Comprehensive reviews such as this serve a real and valuable purpose by bringing to the general public—if 'Top People' may be so-called—not only an insight into the vast range of products put out by the industry but some idea of its enormous resources; its ramifications reaching into almost every industry; its technical achievements; its initiative in seeking new, and widening existing, markets; its far-reaching research and training programmes; its eye on the future. It is good, even for those within the industry, to read and realize again the ubiquity of rubber. Contributors to this noteworthy supplement represent all sides of the industry and include *RJIP's* technical editor.

Diploma Progress

THE number of students taking advance courses leading to the award of the new Diploma in Technology has increased more than two-and-a-half times during the past 18 months.

In a foreword to the second report of the National Council for Technological Awards, Lord Hives, the chairman of the Council, says that 2,518 students are now following 66 courses leading to the diploma at 20 colleges as compared with 965 students following 37 courses at 11 colleges in November 1957. This is encouraging progress. Since the Council was set up by the Minister of Education just over three years ago the first Diplomas in Technology have been awarded and shortly several hundred diplomates will be taking their place in industry each year. The Council express their great indebtedness to the technical colleges and to the industrial organisations whose efforts have made possible 'this rapid and striking development.' Lord Hives, in paying his tribute to industry refers to the fact that 82% of students following sandwich courses leading to the Diploma in Technology have their fees paid by their employers.

Technical Education

IN the light of the above, it is interesting to note the announcement by Mr Geoffrey Lloyd, Minister of Education, of a new capital investment programme planned to cost £54 million for technical education in the three years after 1961. In a circular to local education authorities Mr Lloyd says that, in order to maintain the momentum of the advance in technical education, a building programme of £15 million will be approved for 1961-62 and that programmes for 1962-63 and 1963-64 will be provisionally set at the same figure. This total programme of £45 million is expected to involve consequential expenditure of £9 million on equipment.

On Show

THERE appears to be no sign yet that the number of exhibitions, so notably increased this year, will not continue to rise. One of the reasons, of course, is the change of emphasis, on functions as much as materials and equipment, together with the emergence of new industries and the growth of the newer ones. Nuclear energy, automation, mechanical handling, electronics, all now have their own exhibitions. Even so, the plastics industry may well claim pride of place in the number of exhibitions at which its products, machinery and equipment are displayed. Among others, current and yet to come this year, are those at Hanover (open now and until May 5), Paris in June and Dusseldorf in October and, of course, the International Plastics Exhibition at Olympia, June 17 to 27. One omitted from the above list of subjects is the Careers Exhibition which opens towards the end of this month (May 26-June 5). It is worth noting that one of the most effective stands on this occasion promises to be that of the Federation of British Rubber and Allied Manufacturers.

NEWS *Briefs*

JAPANESE POLYTHENE — US STRIKE — PIRELLI CAPITAL INCREASE — DUTCH CARBON BLACK PLANT—CZECHOSLOVAKIAN SR—GHANA RUBBER

●**Czechoslovakia**—Test production of synthetic alcohol from waste gases in the production of petrol and oil has started in the Usti-on-Elbe region, in northern Czechoslovakia, according to the Czechoslovak news agency Ceteka. The agency says that the building of a factory for the production of synthetic alcohol is planned. The alcohol is to be the main raw material for producing synthetic rubber.

●**Australia** — Vacuum Oil Co. Pty. Ltd. has announced the formation of a new company, Australian Synthetic Rubber Co. Ltd., to make synthetic rubber at the new multi-million pound petro-chemical project at Altona, Victoria. The managing director of Vacuum, Mr E. A. Jones, said Australian rubber companies had been invited to participate in the new company, which would produce synthetic rubber from materials supplied by the petro-chemical industry. He expected that work would start this year, and operations of the plant begin by mid-1961.

●**Ceylon**—Talks on the revision of the trade pact between Ceylon and China, under which Ceylon buys rice and sells rubber, were expected to be resumed towards the end of this week, according to Ceylonese Government sources. The talks were suspended when a deadlock was reached about three weeks ago.

●**Ghana** — Exports of rubber from plantations in the Dunkwa area during February totalled 79,365lb. The comparative figure for February 1958 was 63,556lb. Exports of crude rubber during 1958 amounted to 433 tons, compared with 331 tons in 1957.

●**United States** — The Continental Carbon Co. has announced that it will build a 2,500,000 dollar carbon black plant at Rotterdam, the Netherlands, with an initial capacity of 15,000 tons of high - abrasive carbon black annually. Continental Carbon Co. is owned by Continental Oil Co., Shamrock Oil and Gas Corporation and Witco Chemical Co. Completion of the plant is expected in early 1960. Product distribution will be through the Witco organization.

●**Japan** — Sumitomo Chemical Co. and Mitsubishi Petro-chemicals are reported to be planning to increase their present polythene production capacity by 15,000 and 10,000 tons a year, respectively, in anticipation of increased demand. Total requirements for 1959 are said to be about 60,000 tons of which a large part has to be satisfied by importing.

●**Venezuela**—A factory to manufacture carbon black for the Venezuelan tyre industry is to be built near Moron by Negros de Humo Venezolano, according to reports.

●**Brazil**—A Brazilian trade mission has arrived in Singapore to investigate the possibility of buying more rubber and of selling larger quantities of Brazilian coffee and other exports. The leader of the mission said Brazil was now importing over 75 million Straits dollars worth of rubber yearly because domestic production was not sufficient to meet her requirements.

●**Italy** — The board of Societa Pirelli Co. has announced that the increase in its capital from 2,640 million lire to 6,000 million lire, which was decided at the shareholders' meeting on March 23, will be made from May 4 to 20.

●**United States** — The strike in the US rubber industry continues. A spokesman for US Rubber Co. told Comtelburo on Tuesday that the company and the union had met and no progress had been made towards a settlement.

HAPPY BIRTHDAY

Birthday greetings to Mr R. Geddes (Dunlop Rubber Co. Ltd.) and Mr B. J. A. Martin (Tyre Compound Laboratory, Tyre Technical Department, Fort Dunlop) for May 7; Miss Elvera G. O. Franklin (Anchor Chemical Co. Ltd.) May 8; Mr W. H. Sanderson (Avon India Rubber Co. Ltd.) May 10; Dr C. A. Redfarn May 11; Mr L. Harral May 12; Mr B. W. D. Lacey (Tyre Design Division, Fort Dunlop) May 18; Mr F. A. Jones, Inventions and Patents Department, Dunlop Research Centre) and Mr D. H. Carlisle (P. B. Cow and Co. Ltd.) May 20; Mr D. D. Marshall (Greengate and Irwell Rubber Co. Ltd.) May 21; Mr H. C. Baker (London Advisory Committee for Rubber Research, Ceylon and Malaya) May 25; Mr G. E. Beharrell (Dunlop Rubber Co. Ltd.), Mr W. R. Bourne (H. and W. Bourne Ltd.), Mr W. A. Hazlett (Goodyear Tire and Rubber), Professor G. Stafford Whitby, Mr W. Humphries (Tyre Design Division, Fort Dunlop) May 26; Mr E. H. J. Humphrey (Siemens Electric Lamps and Supplies Ltd.) May 27; and Mr S. B. Cant (Technical and Development Manager, Lintafoam Ltd.) May 28.

∴Duly authenticated dates for inclusion in this feature will be welcomed by the Editor.

'It's so sordid — having to meet like this!'—437

Vinyl Stabilization*

SOME NEW MATERIALS AND TECHNIQUES

PART I — ORGANOTINS

By H. Verity Smith
Meister A. G., Basle, Switzerland

SUMMARY

The development of the different types of organotin stabilizers is briefly adumbrated and comparative evaluations are presented on both weight and cost basis.

The degree of specificity of metal ratios required to design stabilizer systems for specified PVC polymers is illustrated.

A new system of providing tailor-made one-package stabilizer systems based on a series of unifunctional, mutually miscible bases, is described. The technical and commercial advantages of this system are enumerated.

OUR recent decision to commence manufacture of organotin stabilizers on a large scale in Switzerland involved a detailed consideration of the relative efficiency of the existing types which are described in the 106 British and American patents on these materials which have been granted up to the middle of 1958.

It was decided to compare the major chemical types described in the literature with some new developments of our own, using two different bases of comparison; firstly a weight basis, taking 2 phr of stabilizer, and secondly on a tin content basis taking 0.5gm. of tin per 100gm. of polymer. This latter comparison is of more than academic interest as the tin content can be roughly related to manufacturing cost.

Four groups of organotins were compared, carboxylic acid salts, maleates, alkoxides and thio-compounds. Altogether 41 compounds were evaulated and the data presented in Fig. I is a small selection of the more interesting results.

(a) Dibutyltin Carboxylic Acid Salts

Dibutyltin dilaurate, Fig. I, No. 1, the oldest practical organotin stabilizer, for which the first patent application was made in 1936, is compared with the dibutyltin salt of a mixture of cheap naturally-occurring fatty acids (No. 2). It should be noted that despite its comparatively poor performance as a heat stabilizer, dibutyltin dilaurate retains its place as an important commercial stabilizer primarily on account of its outstanding performance as a light stabilizer.

Meister Z3 (No. 3) is the polymeric reaction product of dibutyltin oxide and a dicarboxylic acid having an unsaturated side chain. The commercial product is dissolved in an epoxy plasticizer in order to provide a material of convenient viscosity. This product has outstanding light stability.

(b) Maleates

The earliest of the maleate stabilizers was dibutyltin maleate, for which the patent application was dated 1940. As may be seen from Fig. I (No. 4) it is still the most powerful heat stabilizer of this group. Its virtual abandonment by the industry is due to the combination of disadvantages. The polymer is insoluble in plasticizers and difficult to disperse in vinyl compounds, particularly plastisols. Its calendering properties are very bad, for it has a tendency to cause sticking to the rolls, and it also has a tendency to sweat, particularly after exposure to sunlight. Its excellent colour inhibiting properties have led to a number of attempts to incorporate the dienophilic maleic nucleus into other structures. Two of the most successful are illustrated in Fig. I, the bis (dibutyltin monolaurate maleate (No. 5) and the dibutyltin salt of an alkyl half-ester of maleic acid (No. 6). It will be seen that neither of these compounds has the inherent heat stabilizing effect of the straight maleate, but neither do they exhibit the undesirable properties of the maleate, though the bis (dibutyltin monolaurate) maleate, has some tendency to polymerize on storage. It will be seen that in terms of tin content, and therefore in terms of manufacturing cost, the position is much more nearly one of equality, and it is interesting to note that the half ester type (No. 6) is, on this basis, superior to the bis-compound (No. 5).

(c) Alkoxides

The first organotin stabilizer to result from development on this side of the Atlantic was dibutyltin dibutoxide, which was disclosed in a patent by Staudinger and Cleverdon of the Distillers Company in 1947. The sample illustrated (No. 7) is the monomer. The polymeric form was popular in the United States for some years, but now seems to have lost its market, probably because of a lack of compatibility. The advantage claimed for the monomeric material is that the reaction product during the stabilization reaction is the alcohol, instead of the acid as is the case with the carboxylates. The alcohol is easily volatilized out of the compound and does not cause the clouding of the compound associated with, for example, lauric acid.

The use of a structure containing both an alkoxide residue and an alkyl maleate half-ester residue has resulted in one of the best and most popular organotin stabilizers now being manufactured both in Europe and the United States (No. 8). This compound has the virtue of compatibility and absence of haze formation associated with the alkoxide, together with the colour-inhibiting action associated with the maleate. The structure of these two stabilizers is illustrated in Fig. IV.

(d) Thio-compounds

The striking difference in stabilizer performance which results from the introduction of an Sn–S bond into the structure is immediately apparent from the most casual observation of columns 9—12 in Fig. I. The difference is equally marked whatever basis of comparison is used, and there is little doubt that if it were not for the foul odour of these compounds, they would long since have replaced all the other organotin types.

The history of the first of this group of compounds, dibutyltin didodecyl mercaptide (No. 9) is curious. It was the subject of a patent application by C. E. Best of the Firestone Company on June 27 1950. Three days later, on June 30 1950, an essentially similar application was filed by Leistner and Knoepke and there have subsequently been two further attempts to patent the dialkyltin dimercaptides as stabilizers, and in each case the example selected has been dibutyltin didodecyl mercaptide. It is a very widely used material, and in terms of value is probably one

**Part of a paper delivered at 'Plastteknik 1958,' Stockholm, reproduced by courtesy of the Swedish Plastics Federation.*

of the most important single stabilizers now manufactured.

The second sample in this group (No. 10) is also representative of an important class of commercially manufactured stabilizers, the thioglycolates, which are second in importance to the mercaptides and essentially similar in performance. No. 11, the third sample, is a thiomalate of the type patented by Crauland of St. Gobain. The last example is a new development of our own, Meister Z4 (No. 12), which combines exceptional heat stability with a marked improvement in light stability over some of the other mercaptide types. This has hitherto been one of their weaknesses.

(e) The Economics of Organotin Stabilizers

The organotins are the most expensive stabilizers on the market and are likely to remain so, the principal reason being the high cost of the manufacturing process coupled with the high cost of tin metal. Of course, tin is not as expensive as cadmium, but organotin stabilizers have in general a much higher metal content than have cadmium stabilizers. In this connexion it is interesting to note that the International price support arrangement for tin metal is now experiencing severe difficulties as a result of dumping by the Communist bloc, and this may make possible a small price reduction in organotin stabilizers in the future.

The sales of organotin stabilizers in Europe are still rising, though not at the same rate as the sales of vinyl chloride polymers. In other words, organotins are taking a declining share of the market. It may well be, as would appear to be the case in the United States, that this relative decline will be followed by an absolute decline until the point is reached at which organotins are only used for purposes for which there is no alternative to their use. This would probably correspond with a level of output 15 or 20% below the present level. The reduction in cost possible by recourse to new synthetic methods being developed may materially postpone this decline, but it is unlikely that it can be delayed indefinitely.

PART II

The Group II Stabilizers and Their Synergists

The vinyl stabilizers can be divided into five groups. Highest, of course, come the organotins, both in price and efficiency.

Second in price level come what may be described as liquid proprietary stabilizers based on the metals of Group II of the periodic system of the elements, particularly strontium, barium, cadmium, and zinc, together with synergists such as epoxy resins and polyhydric alcohols and chelating agents such as alkyl and aryl phosphites. Cheaper in price, but gradually giving place to the more highly developed liquid group II compounds, come the simple and double soaps of the group II metals. Lastly in this series come the lead stabilizers. Outside this scheme altogether are the amine stabilizers which by virtue of their special properties and special limitations do not generally enter into the competitive picture with the four other groups.

When the organotins were first introduced they competed with the simple soaps of the group II metals and with mixtures of these soaps, later with compound soaps such as barium-cadmium stearate.

When the liquid stabilizers based on group II metals were introduced they immediately began to take a large share of the simple soap market and a smaller, but, in the United States very significant, share of the organotin business. At the other end of the price scale the new proprietaries are undoubtedly taking some of this business from lead stabilizers.

This naturally resulted in a situation where the manufacturers of organotin stabilizers and of lead stabilizers sought to protect their interest by entering the Group II proprietary stabilizer field. Metal and Thermit Corporation in the United States, and Pure Chemicals Ltd., in England, both pioneers in organotin stabilizers, entered the barium-cadmium field, National Lead Co. in the United States, the leading manufacturer of lead stabilizers, similarly entered the new market. There are now signs that the manufacturers of straight soaps are following the same path, a notable example being Otto Bärlocher G.m.b.H of Munich.

The consensus of opinion would seem to be that the future lies with the proprietary liquid Group II stabilizers which were largely pioneered by Argus, Ferro and Advance in the United States.

The present author does not share this view.

The great feature of the barium-cadmium-zinc-epoxy-chelating agent system is its flexibility and degree of adaptability to different polymers and processing conditions. The proprietary stabilizers tend to nullify this virtue by fixing the ratio of the components in such a way as to provide maximum possible coverage of polymers and applications. The processor, on the other hand, is only concerned with one application at a time, and for any one set of conditions it is usually possible to design a better stabilizer system than any of the proprietaries, which are designed for the widest possible spectrum of applicability.

For example, the barium to cadmium ratio in most proprietary stabilizers is 2:1 by weight, and this is the best compromise, giving the widest range of applicability. That different polymers have differing optimum barium-cadmium ratios is not widely known, though it is comparatively easy to demonstrate (Fig. II) and economically of the first importance as cadmium oxide is about twenty-five times the price of barium hydrate.

Fig. II shows that on two suspension polymers, Solvic 239 and Opalon 300, the usual 2:1 ratio, represented by the middle column, is by no means the most economic. In the case of Solvic 239 specificity is so low that it is probable that an even higher ratio than the 2.7:1 barium to cadmium shown could be safely employed. At 2.7:1 the stabilizer is about 10% cheaper than the normal 2:1 mixture. The ratio for Opalon 300 is more critical in that higher doses of cadmium reduce the period of heat stability; while the same ratio as for Solvic 239 could be used, a more efficient one would appear to be in the ratio of 2.25 to 1.

The same method applied to a vinylidene chloride copolymer, Geon* 202, and an emulsion polymer, Carina 16, reveals a completely different picture. It is evident that on Geon 202 a ratio of not more than 1.6:1 should be used, and on Carina 16 the optimum is about 1.8:1.

These four polymers were chosen for reasons other than their barium-cadmium ratios and in this respect may be said to be a random selection.

There is a modern tendency, one might almost say fashion, towards the use of zinc to improve the early colour of compounds stabilized with barium-cadmium systems. It has, however, been recognized that the ratio between barium-cadmium and zinc is so specific for each polymer that most manufacturers present a two-package system. Fig. II provides a graphic illustration of this point. In each case the 'standard' ratio of barium to cadmium has been employed, the metal contents being 136mg. Ba and 68mg. Cd per 100gm. of polymer.

On Solvic 239 the zinc ratio should be as low as possible; whereas on Opalon 300 at least 25mg. zinc per 100gm. of polymer are required.

The demonstration suggests that

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SYNTHETIC RUBBERS

with Geon 202 there is an area of dosage to be avoided, while with Carina 16 it would appear that zinc itself is to be avoided.

It cannot be emphasized too strongly that these illustrations are not based on recommended stabilizer systems. No epoxy compound was used in these formulations, with the deliberate intent of heightening the effect of the zinc on the terminal decomposition reaction. In practice an epoxy must always be employed if a zinc stabilizer is used. There are no exceptions to this rule.

A further demonstration serves to illustrate more clearly the specificity of stabilizer systems in general (Fig. III).

Fig. III shows three different stabilizer systems on two different polymers. The left hand pair show a very high-performance organotin stabilizer, Meister Z4, on a suspension polymer (extreme left) and an emulsion polymer (adjacent). Despite the widespread theory that sulphur-containing organotins are of maximum effect on emulsion polymers it is the suspension polymer which gives the better result.

The second pair of tests illustrate a standard barium - cadmium - zinc-epoxy-chelating agent system on the same two polymers. As would be expected, the performance is better on the suspension polymer, but the difference may be regarded as somewhat striking.

The last pair are stabilized with strontium naphthenate, an old-fashioned, and largely discarded stabilizer. It will be observed that it gives a better performance on the emulsion polymer than does the complex modern system.

PART III

A New Method of Making and Distributing Stabilizers

Stabilization may be regarded as a specialized prophylactic treatment which a vinyl compound needs if it is to be processed satisfactorily and give acceptable service in use.

This treatment is a narrow but complex branch of vinyl technology which is best handled by a specialist. It is the function of the specialist to diagnose the probable nature of the sickness which will develop under given circumstances and to prescribe a suitable treatment. It is then necessary to prepare a suitable prophylactic formulation as effective as the limitations imposed by economic circumstances permit.

This is a medical analogy of the method which we have developed: the two conventional methods of stabilization can be described in similar terms. The older method is to overstabilize with a cheap simple stabilizer such as basic lead carbonate —this may be likened to the administration of large doses of bicarbonate of soda in cases of acid indigestion. The more modern method is to use a proprietary stabilizer, which may be likened to the use of an expensive and well-advertised proprietary pharmaceutical preparation or 'patent medicine.'

Our method is to examine the patient and prescribe a remedy designed for that patient's particular condition. Working on the assumption that for every polymer there is one stabilizer system of optimum efficiency, and on the assumption that the customer wishes to pay only for material which is necessary to his purpose, we devise a stabilizer system exactly suited to that purpose insofar as cost permits: in the matter of costs we are, of course, subject to limits imposed by the customer.

Instead of arriving at this formulation in the conventional manner by recommending the customer to use a mixture of two or more proprietary compounds, we select appropriate quantities of the required active principles in liquid form and blend them to make a tailor-made-one-package stabilizer, expressly designed for this one particular application.

This has been made possible by preparing a series of unifunctional bases, each having only one active ingredient, all the bases being liquids of similar viscosity and completely miscible with each other in all proportions.

As opposed to the normal practice of making proprietary stabilizers and recommending the use of mixtures of them for specific applications, the new system has a number of striking economic and technical advantages.

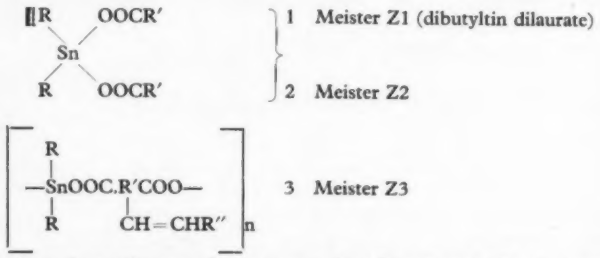
In the first place there is no waste of material. In making proprietary stabilizers, it is necessary, as has been stated, to cover the requirements of a variety of polymers. Take the example of the barium-cadmium system already illustrated. The normal 2:1 ratio is wasteful on Solvic 239 because it contains too much cadmium. It is also wasteful on Geon 202 because it contains too much barium.

In the manufacture of liquid barium - cadmium stabilizers it is customary to incorporate a slight excess of chelating agent. It is also customary to include a slight excess of chelating agent in zinc stabilizers. When the two are used together, as is frequently the case, two excesses of the same component are used, and the additional material serves no useful function, having no metal chloride to chelate.

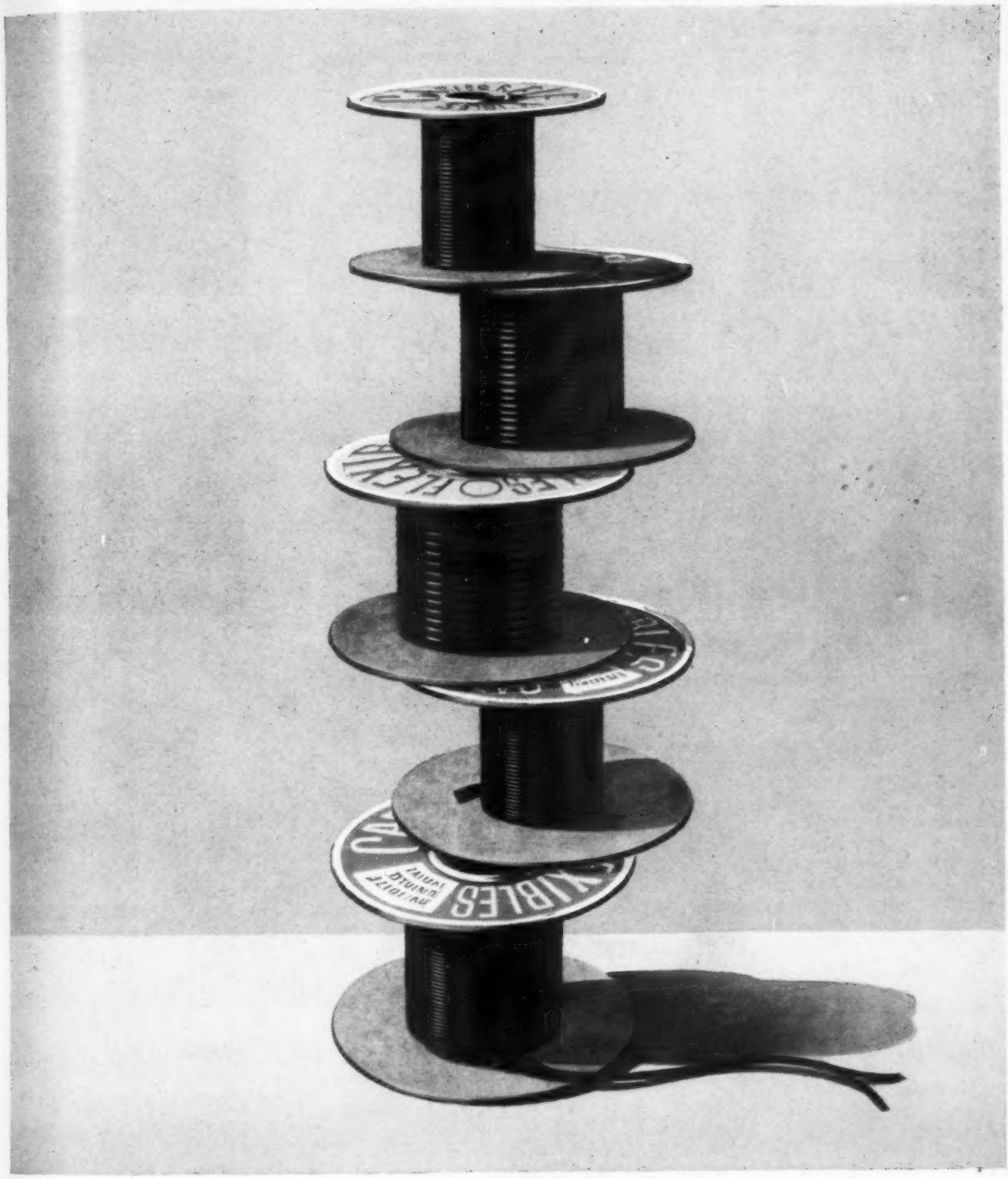
These are merely typical examples of a general phenomenon; it may be said with confidence that it is always possible to make more economic formulations than any mixture of proprietaries if only a single application is being considered.

The majority of proprietary stabilizers are not mutually miscible. It is therefore impossible in most cases to prepare one-package systems from them. The customer must weigh them separately. This imposes extra operations on the customer which the new method obviates. But there is a less obvious and more significent consideration than the cost of making the weighings, namely the accuracy with which it can be done. The stabilizer service laboratory, or the customer's own laboratory may find that the ideal combination for a particular application is, for example 1.65 parts of A, 0.3 parts of B, 0.45 parts of C and so on. If the customer's batch is based on 50Kg. of polymer this means weighings of 825gm., 150gm., and 225gm.; if the second decimal place of the recommended dosages is to mean anything the weighings must be accurate to 10gm. This degree of accuracy does not exist in the average PVC compounding shop, either by reason of the weighing equipment in use, which frequently has to accommodate the much greater weights of the main constituents of the compound, or because of the quality of the labour employed.

The laboratories are aware of this and play safe. They recommend 1.75



Structure of organotin compounds referred to in Fig. I (*continued on page 661*)



VYNAMON GREEN BES for PVC in electrical work

The high performance necessary in electrical work today makes heavy demands on pigments. Their chemical and physical form must be closely controlled; they must be free from impurity and uniform in quality.

VYNAMON GREEN BES combines brilliance of hue, high fastness and low interference; it is consistent in shade, dispersibility and electrical properties.

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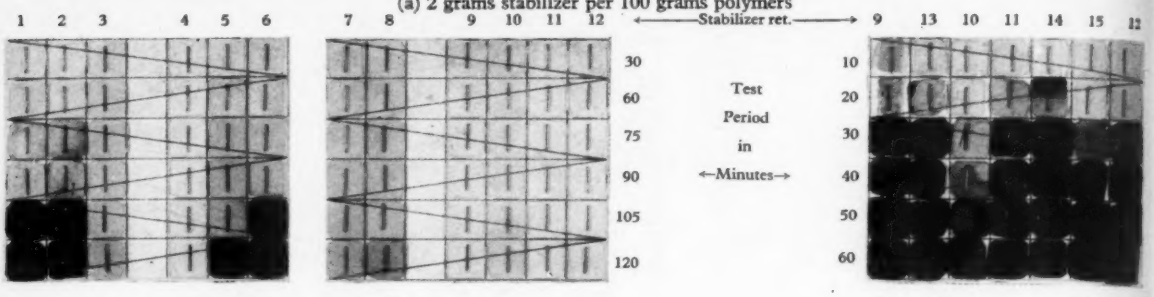
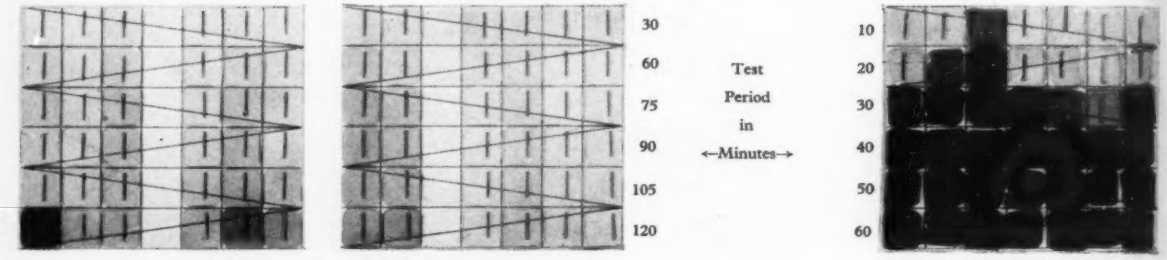
Fig. I—Organotin Stabilizers

(a) 2 grams stabilizer per 100 grams polymers



Test Temperature: 175°C. *Test Temperature:* 200°C.

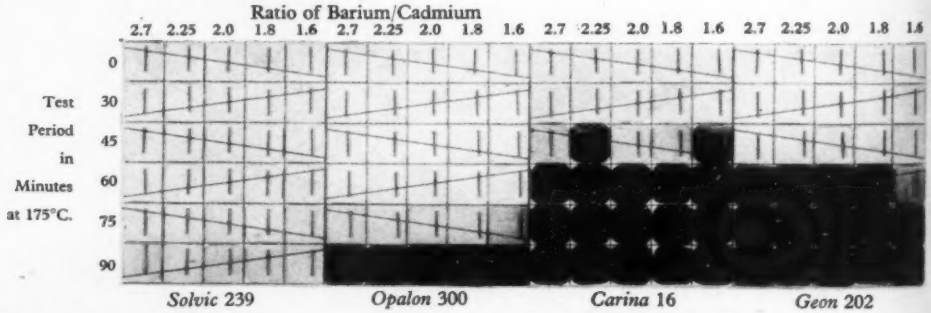
(b) 0.5 grams tin content per 100 grams polymer



Test Temperature: 175°C. *Solvic* 239 *plasticized with* 50 *phr DOP*

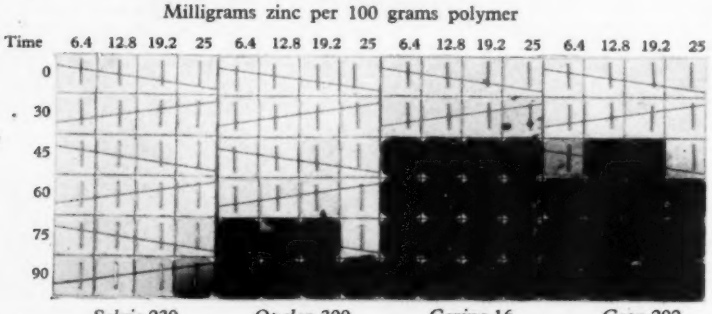
Test Temperature: 200°C. *Solvic* 136 *unplasticized*

Fig. II(a)—Barium-Cadmium Ratios (50 phr DOP)



Solvic 239 *Opalon* 300 *Carina* 16 *Geon* 202

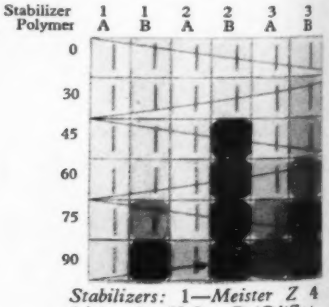
Fig. II(b)—Zinc Response (50 phr DOP)



Solvic 239 *Opalon* 300 *Carina* 16 *Geon* 202

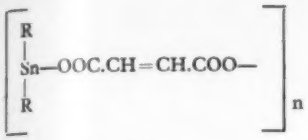
Test temperature: 175°C. *Each compound contains a Ba/Cd Stabiiizer* (2 : 1) *at the same dosage as in Fig. II (a).*

Fig. III—Specificity

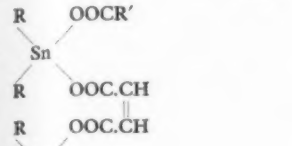


Stabilizers: 1—*Meister Z* 4 *(tin);* 2—*U.S. Ba/Cd/Zn/ Epoxy;* 3—*Sr Naphthenate Polymers: A—Suspension, B —Emulsion.*

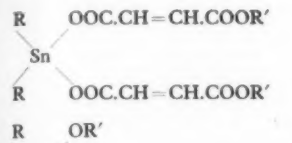
Heat stability test demonstrations referred to in the text



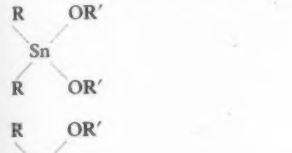
4 Dibutyltin maleate



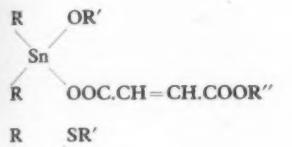
5 bis-(dibutyltin mono-laurate) maleate



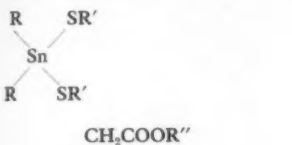
6 dibutyltin bis-(monoalkyl maleate)



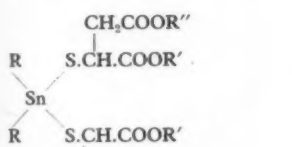
7 Dibutyltin dialkoxide



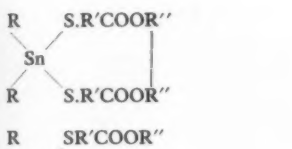
8 Dibutyltin alkoxide alkyl maleate



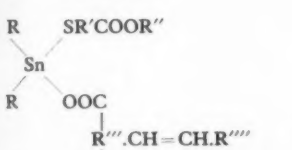
9 Dibutyltin dialkyl mercaptide



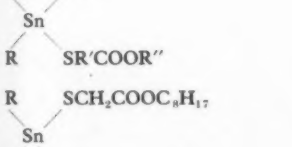
10 Dibutyltin SS′ bis(dialkyl thiomalate)



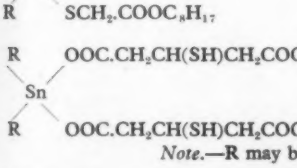
11 Meister Z5



12 Meister Z4
15 Meister S37



13 Dibutyltin di-iso-octyl thioglycolate



14 Dibutyltin S,S′ bis(mono-octyl thiomalate)

Note.—R may be hydrogen, alkyl or alkylene

Structure of organotin compounds referred to in Fig. I (*continued from page 558*)

parts of A, 0.5 parts of B and 0.5 parts of C, knowing that they are ensuring a margin of safety as far as the quantity of each ingredient is concerned, and sacrificing accuracy in the precise ratio of the ingredients which would give the optimum performance.

Using the new system, however, the stabilizer is prepared in bulk by mixing the various ingredients in exactly the correct ratio, using equipment which is not required to serve any other purpose. The customer has only to make one weighing operation and can only make one error. This error cannot affect the optimum ratio of the components because we have fixed them in advance by making the mixture.

The scheme has also a number of significant commercial advantages. Manufacturers of proprietary stabilizers have been compelled to make an ever-increasing range of products, and most of them have thirty, forty or even fifty items on their lists. This does not make for economy in manufacture or distribution. By the use of a small number of bases, eight to be precise, we are able in large measure to avoid this difficulty.

Stabilizers are materials which are sold in comparatively small quantities, and customers seem to expect to be able to buy from stock. It is a very expensive matter to maintain stocks of forty different materials in a number of main distribution centres. It is, however, economic to maintain stocks of eight compounds, together with a mixing unit, linked by telex to the central laboratory, at strategic points. The establishment of such centres, one in Stockholm to serve Scandinavia, one in South Holland to serve Benelux for example, permit the provision of a rapid delivery service far more cheaply than would be possible with the conventional ranges of stabilizers.

Acknowledgments

The author wishes to acknowledge with gratitude the collaboration of Dr Rolf Schneider, Dr R. Tunteler, Mr S. Pezzaro and Mr A. J. Muelenberg, without whose assistance the demonstrations in this paper could not have been prepared.

Francis Shaw Contract

Francis Shaw and Co. Ltd. have recently signed a contract with Polimex of Warsaw for the supply of rubber and plastics machinery to the value of £262,240. Included is an internal mixer, a rotocure unit and general purpose rubber and plastics machinery.

Microcellular Soles

NEW DIRECT-MOULDING PROCESS

AN important development in the shoemaking world, and one that has very considerable interest for rubber technologists, has been announced by C. and J. Clark Ltd., of Street, Somerset. The result of team work between engineers, shoemakers and rubber chemists within the Clark organization, the development makes possible the direct moulding of shoes with microcellular soles and heels.

The extent of the technical problems overcome by Clark technologists can be gauged by the fact that most shoemakers and rubber manufacturers considered the development to be impossible of achievement. This success follows pioneer efforts by the company which led to the introduction some five years ago of direct moulded footwear.

With the new process, the finished resin-rubber sole can be provided with a graduated porosity from its tread surface to the shoe insole. This means that the tread surface of the sole can be provided with a tough, hardwearing smooth skin of high density rubber, whilst the centre of the sole mass is made up of unconnected air cells with a further skin on top. While much of the secret of the process lies in the design of the mould, success depends also upon the nature of the compound and the degree and extent of the blow. Likewise, there is the problem of where to stop formation of the lower skin and start the microcellular structure and, equally, where to stop this and start the upper skin layer.

Vulcanizing is at 300°C. but temperatures are scaled down to about 150°C. Both natural and synthetic rubbers are used, the proportions varying from approximately 45/55 to 35/65 respectively. There is a possibility that 100% synthetic rubber may be used. The company, which has its own rubber laboratory, makes its own neoprene adhesive, and obtains synthetic rubber from the International Synthetic Rubber Co. Ltd., Hythe, and from US sources.

B. F. GOODRICH EXPANSION

B. F. Goodrich Co. will be operating three new tyre plants and a special purpose synthetic rubber factory overseas in which the company will hold a majority interest, it has been announced. A new tyre plant is under construction in Brazil and should start operations in November 1959, a second plant is under way in Australia, and is scheduled to start production in the first quarter of 1960, and a third is being built in Persia and should be in production by January 1961. A synthetic rubber plant in Holland should also be in production by August of this year. Plans for 1959 and 1960 provide for further substantial capital expenditure projects in both the domestic and foreign business fields.

Mr Arthur Kelly, executive vice-president, said that in an effort to protect themselves from market fluctuations, B. F. Goodrich had acquired latex gathering, concentrating and shipping facilities in Malaya. In addition, the company would soon complete planting of ten thousand acres of natural rubber in Liberia, and small-scale production would begin in 1961.

Rubber Replanting Record

The Washington Embassy of the Federation of Malaya reports that an all-time record for a single year of about 130,000 acres of rubber smallholdings may be replanted this year from grants provided by the Rubber Industry Replanting Board of the Federation of Malaya.

Approved applications from the various States in the Federation for replanting this year at a cost of more than 81 million Malayan dollars to be spread over the next six years are for a total of 136,341 acres—an increase of 39,341 acres over last year.

Union Carbide Appointment

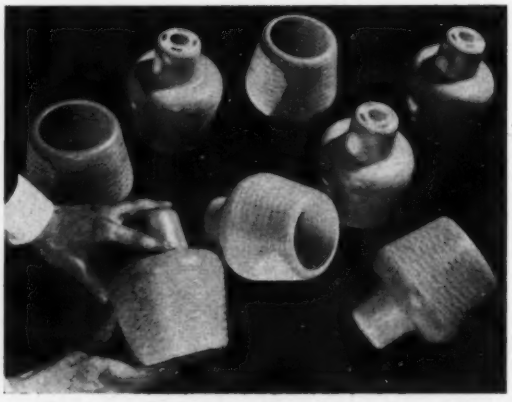
Union Carbide Ltd., chemicals division, recently announced the appointment of Mr J. C. Marshall, B.Sc., to the newly-created post of southern district manager. In this capacity Mr Marshall will be directly responsible for all chemical marketing activities for the whole of the South of England, including the South and West Midlands. All the technical representatives now covering these areas will be responsible to Mr Marshall in his new capacity.

International Plastics Exhibition

DESIGN TRENDS

THREE eminent design experts—Robin Day (UK), Count Sigvard Bernadotte (Scandinavia), and Ernesto Rogers (Italy), will discourse on design trends in their respective countries with reference to plastics products at the International Plastics Exhibition Convention at Olympia. The three speakers in this session also form the panel of judges who will select the best design in the International Design Display for which some 200 plastics consumer products have been gathered from 13 different countries. It is expected that the judges will make some comment on their impressions of the exhibits.

Mr William Lemkin, director and general manager of Dunlop Clothing and Weatherproofs and of Chas. Macintosh and Co., has been re-elected president of the Clothing Institute for the fourth year in succession.



Translucent lampshades which are rigid, light in weight and virtually unbreakable, have been introduced by H. W. Field and Son Ltd., Harold Wood, Essex. Available in five colours, they can be used in the conventional way and are suitable for lamps of up to 100 watts. The lampshades are blow-moulded in Rigidex high density polythene supplied by British Resin Products Ltd. Retail price is 4s. 9d.

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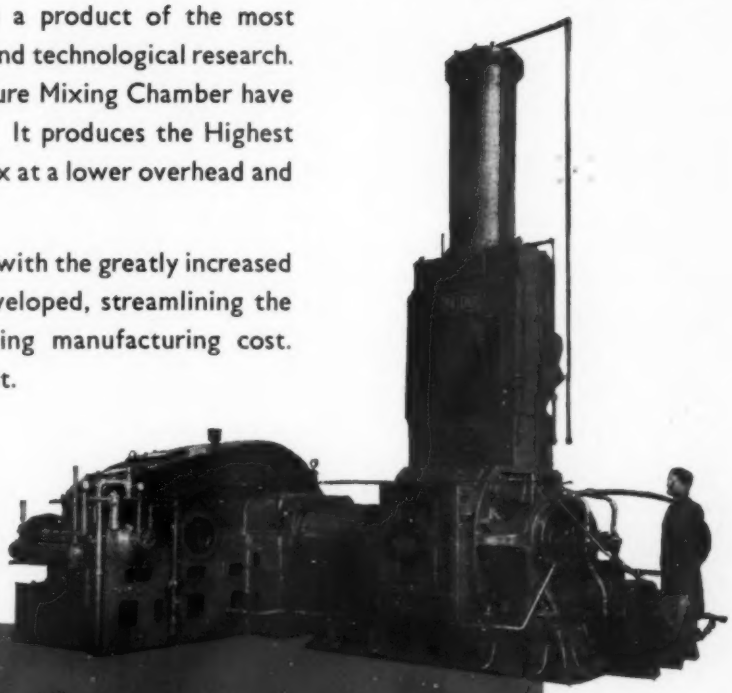
Ancillary Machinery matched to cope with the greatly increased output of these mixers has been developed, streamlining the production flow and further reducing manufacturing cost. Fullest details are available on request.



The diagram illustrates a typical application to a matched production unit

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Rubber Growers' Association

COUNCIL'S FIFTIETH REPORT

TO be presented at the ordinary general meeting of the Rubber Growers' Association on May 9 at 12 noon at 19 Fenchurch Street, London, E.C.3, is the fiftieth report of the Council. Mr T. H. Miller has been nominated chairman of the Association for the ensuing year, succeeding Mr A. W. Wallich, and Mr W. Anderson as vice-chairman.

Membership of the Association is given in the report as 618, comprising 360 companies and 258 individuals. The issued capital, including debentures, of company members operating in Malaya, Indonesia, Ceylon, British Borneo, Africa and other countries, is quoted as £89m., and the acreage under rubber as 1,505,800.

The following is a summary of the Council's report:

Malaya Committee

The passing of the Malayan Rubber Fund (Research and Development) Ordinance will, it is hoped, mark the beginning of a new era in the industry's research effort. During the preparation of the Bill the Minister of Commerce and Industry ensured that there was the fullest consultation with the Rubber Producers' Council, and the industry is most grateful to him for being given the opportunity of offering advice on matters of vital concern to its future. Through the Rubber Producers' Council, the Malaya Committee was enabled to put forward its views on many aspects of the proposed legislation and most of the suggestions made by the Committee were accepted by Government.

The five members appointed by the Rubber Producers' Council to the Malayan Rubber Fund Board set up under the Ordinance include Mr L. H. N. Davis of the Rubber Growers' Association.

The Committee record the steps taken with regard to insurance changes proposed by the Fire Offices Committee (Foreign) and Lloyds Underwriters to modify substantially the cover operative in Malaya in respect of riot and civil commotion. In their view the new provisions were unreasonable and could have amounted to a total denial of insurance. A number of meetings were held and a report circulated to members.

The views of the Committee were sought by the Rubber Producers' Council on a proposal that the International Labour Organization should at the invitation of the Federal Government, set up a productivity centre in Malaya. The Committee's view was that it should be left to the new Controller of Research (Sir Geoffrey Clay) to implement the proposals in the Report of the Blackman Committee and to decide on the desirability of establishing the industry's own productivity centre without ILO participation.

Indonesia

The Indonesia Committee has again been actively concerned regarding the attitude of the Indonesian Foreign Exchange Control to the question of profit remittances. The Committee is continuing its efforts to impress on the Indonesian authorities the serious situation confronting many companies through lack of adequate sterling resources.

On the subject of the renewal of expiring concession titles on the east coast of Sumatra, the report records the serving in January 1959 of notice to four British estate companies, that their expired concession titles would not be renewed, and that the properties in question were to be handed over to Indonesian nationals forthwith. Since this precipitate action was contrary to assurances given in the past, and as the official notices made no reference to any intention to indemnify owners, immediate representations were made to the Ministry of Agrarian Affairs in Medan and Djakarta, and also by the Committee to The British Foreign Office and to the Indonesian Ambassador in London.

Unfortunately no concrete results have yet materialized and in fact at the time of writing this report two concessions have already been taken over, whilst two companies are under notice to hand over estates and complete inventories not later than the end of March.

West Africa

During the year the West Africa Committee has discussed among other matters the proposed establishment of a Marketing Board for rubber in the Western Region of Nigeria. The Committee was of the opinion that such a development would impose grave restrictions and would remove any incentive for the investment of new capital in rubber in the region. Accordingly the Committee gave its support to representations which were made to the Premier of the Western Region of Nigeria on the proposal. Following these representations the Prime Minister issued a statement which the Committee regarded as a guarantee to large-scale foreign plantation interests that they would have complete freedom of operation.

The Committee has also made contact with the Plantations Association of Nigeria and the Cameroons, and has arranged to correspond with this body on matters of mutual interest.

British Borneo

The British Borneo Committee has continued close co-operation with the North Borneo Planters' Association. Although local shortages of labour still occur, the overall labour situation has become much easier and labour matters have not taken up much of the Committee's time in the year under review.

Commercial Research

Among a number of matters to which the Commercial Research Committee has given its attention during the year were: sampling to sub-marks; a new process for preparing sheet rubber; SP rubber; rubber production costs; freight surcharge; loss in weight tolerances; and developments in synthetic rubber.

Taxation and Finance

The Taxation Committee, assisted by the Taxation Advisory Committee, which is composed of the taxation experts from the various Agency Houses, has continued to watch over matters connected with the taxation of the industry and to advise on a number of problems affecting members of the Association as a whole, which have been submitted to it from time to time.

The subscription revenue for 1958 amounted to £29,893. The reduction of £1,011 on that of the previous year is mainly attributable to a fall in company membership largely as a result of 'take-over' bids or amalgamations. Sales of estates by members have also affected income adversely. Interest amounted to £1,430 and after taking into account other receipts the total income was £31,462. Expenditure totalled £27,896—the surplus for the year being £3,566.

FURNACE

VULCAN 9 SAF
VULCAN 6 ISAF
VULCAN 3 HAF
VULCAN C CF
VULCAN SC SCF
VULCAN XXX SCF
VULCAN XC-72 ECF
STERLING SO FEF
STERLING S, PELLETEX } SRF
STERLING NS, PELLETEX NS } SRF-NS
STERLING L, STERLING LL } HMF
STERLING V GPF
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VIEWS and REVIEWS

I.C.I. in 1958

THE 'I.C.I. Review for 1958' covers, as is usual in this annual publication, many interesting facts and figures.

No better brief summary of the 'Review' could well be put forward than that which appears in the document itself. This is as follows:

> 'This Review tells the story of some of the year's principal events, at home and overseas, in production, trade, and research. It also deals with an important aspect of personnel policy, that of accident prevention.
>
> 'The operations described in the Review involve in the aggregate the transport and handling of many millions of tons of material every year, and efficiency in these respects has an important bearing on productivity and profits. For this reason transport and handling has been made the subject of some of the illustrations.'

Developments at Billingham

In the 'Review for 1957' it was mentioned that the scale of organic chemical manufacture at Billingham—based largely on petroleum—had become so great as to necessitate reorganization there and the creation of a Heavy Organic Chemicals Division. It is now reported that the inaugural year of the new Division has been a successful one, for the volume of products sold increased by 13%, notwithstanding increasing competition. With regard to details it is reported that a new plant has been brought into operation for manufacturing nonyl phenol and 'Topanol' O, the latter being made available in various forms to meet the increasing demands of the oil and food industries for substances that prevent deterioration. Other extensions of departments are also referred to, and in 1959 there will be an extension of the para-xylene plant, necessary for increased 'Terylene' production.

Petroleum-Products Progress

It seems to me to be a most interesting indication of the changes in basic materials from which chemicals, plastics, fibres, etc., are derived that 'alkylamines and derivatives of phenol—production of both of which is growing—are now virtually the only divisional products that are not derived from Petroleum.' To pursue this matter a little further, the report states that 'The Billingham/Wilton complex now makes from oil or its derivatives an integrated range of products such as solvents, detergents, plastics, and fibres, and it is the biggest European centre of petroleum chemical production.'

To round off this broad outline it is a startling indication of the vastness of the I.C.I.'s activities that one learns that 'about one-third of the United Kingdom's manufacture of petroleum chemicals is today carried on by the Heavy Organic Chemicals Division.'

Textiles

The fact that a chart showing how the I.C.I. products serve the home market puts textiles first with 15% (value £34.4m.) does suggest that a further reference to this particular industry is desirable. The I.C.I. serves the various connexions which it has with this industry in various ways. Firstly, it supplies a wide range of chemicals for processing the traditional fibres such as wool, cotton and linen. Secondly, it supplies dyes, etc., for dyeing textiles of all kinds and in connexion with various processing problems. Thirdly, the company manufactures the monomers and polymers on which the wholly synthetic fibres such as 'Terylene' are based. The progress of 'Terylene' one gathers, continues along gratifying lines, as has already been indicated.

It may be added that the stage at which I.C.I.'s manufacture ceases varies from one fibre to another. Thus, in the case of 'Terylene' manufacture is continued right through from raw materials to the finished fibre delivered to the textile industry. In the case of nylon, the company takes manufacture only to the polymer stage, this is spun into fibre by British Nylon Spinners Ltd., the capital of which is owned in equal shares by I.C.I. and Courtaulds Ltd. To meet the continually rising demand for nylon fibre, the designing of yet another polymer-manufacturing unit has commenced.

Plastics

The close chemical relationship between man-made fibres and plastics is, I believe, now fairly well known, but it is interesting to note that in spite of growing competition from abroad, the Division's sales increased on the average by 8% during the year. In terms of value, the 'Review' points out that this is the company's principal exporting Division. Total sales for the year were 120,000 tons, compared with 32,000 tons in 1950. 'This represents a more rapid rate of increase than in the British plastics industry as a whole.'

It is noted that the Plastics Division has during the past year assumed responsibility for manufacturing 'Alkathene,' the I.C.I.'s brand of polythene; moreover, a fourth polythene unit is due to come into operation in 1959, and when this is working the total capacity will be over 90,000 tons a year.

HP and LP Polythene

The following statement is quoted verbatim from the 'Review' and may be of special interest to those who have followed the discussions regarding the development of various methods of manufacture of polythene and commercial implications. The 'Review' says:

'"Alkathene" is made by the polymerization of ethylene by the high-pressure process invented by I.C.I. Although types of polythene can be made by low-pressure techniques, these have not notably affected the growth of the market for high-pressure polythene. By far the greater part of the world's total production of this very important plastics material is by the high-pressure process, and requests to work I.C.I.'s process under licence are still being received.'

Nevertheless, as the 'Review' points out, low-pressure methods have been closely studied in connexion with the polymerization of olefines other than ethylene. Thus, research on the polymerization of propylene is in active progress, and polypropylene is being made in a pilot plant at Wilton. The plastic section ends with a reference to the increased demand for 'Diakon,' the company's acrylic

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **DR SCHIDROWITZ**

moulding material, and to foamed plastics in connexion with various applications. The production of the various raw materials in this branch in increasing quantities is being undertaken by the Dyestuffs Division.

Dyestuffs

It appears that the general difficulties of the textile industry, both at home and abroad, inevitably caused some diminution in the sales of dyestuffs in 1958. It is, however, regarded as satisfactory to be able to report that this does not apply to the newly-introduced 'Procion' dyes, the sales of which have steadily increased. There have also been increased sales of the 'Edicol' dyes used for colouring foodstuffs and materials in contact with foodstuffs. It is mentioned that 'recent comparisons have shown that the standard of purity of I.C.I. foodstuffs dyes is unsurpassed.'

'As has been announced in the Press, the company's interest in colour photography will in the future be handled by Ilford Ltd., who will be responsible for the manufacture and marketing of colour film and paper developed from joint photographic research. The organic chemical side of this research will continue in the laboratories of the Dyestuffs Division under the joint guidance of I.C.I. and Ilford Ltd.'

Metals

I am afraid I must pass over reports on such important branches as Pharmaceuticals, Paints and Leathercloths, Explosives, and Overseas Activities, but from the discussion of *Metals* the following, relating to the campaign to establish titanium in the construction of chemical plant, appears to me to be of particular interest. I quote 'In this respect a recent discovery is that of a simple, but very effective, electrochemical process enabling titanium to be used even under certain fiercely corrosive conditions that would normally destroy it. The process depends upon coating the titanium with an extremely thin, and not necessarily continuous, film of platinum. Titanium so treated can be used with advantage, for example, as anodes in brine cells and in other electrolytic processes.'

Accidents

As mentioned at the beginning of this review, it (*i.e., the I.C.I. Review*) also deals with an important aspect of personnel policy, namely, that of accident prevention. 'I.C.I. Review for 1958' concludes with a special section headed 'Prevention of Accidents,' and as this is a subject in which I have always had a special interest, a brief reference appears to be indicated.

As regards general aspects the 'Review' says: 'The safety of employees is a legal as well as a moral obligation. So far as the first of these aspects is concerned the company looks upon statutory requirements as setting no more than a minimum standard and its aim has always been to reduce the accident-rate to the lowest possible level.' This particularly difficult problem is not made easier by reason of the very varied nature of the company's operations, but, nevertheless, there has been for many years a continuous reduction in the accident rate.

In 1930, the 'Review' mentions, there were 3,227 lost-time accidents, or 3.5 for every 100,000 man-hours. In 1958, in spite of the company's increased size, there were only 728 lost-time accidents, or less than 0.5 for every 100,000 man-hours.

Categories of Accidents

As in any other big industrial organization, I.C.I. has two distinct categories of accidents, namely those of a general nature (*e.g.*, burns, falls, cuts from hand-tools, and the like) — by far the greater in number — and those peculiar to the industry. Each category demands a somewhat different approach so far as prevention is concerned, but two features are common to both. The first is that 'by far the greatest single cause of accidents *is human failure*' (italics are the reviewer's). Here the best safeguard, it is held, is to use every possible means to impress on the individual how much his safety and that of his fellows depends upon his personal care and strict keeping to rules. The second is that 'while ultimate responsibility for safety must be established at the highest level, it is necessary to have a continuing chain of responsibility right down to the individual worker, with particular emphasis on the responsibility of management. This last point is the very basis of safety.' This section concludes:

'The individual must be given the right equipment, proper working conditions, and clear instructions for safe working, but the responsibility of seeing that the prescribed procedure is followed is the management's.'

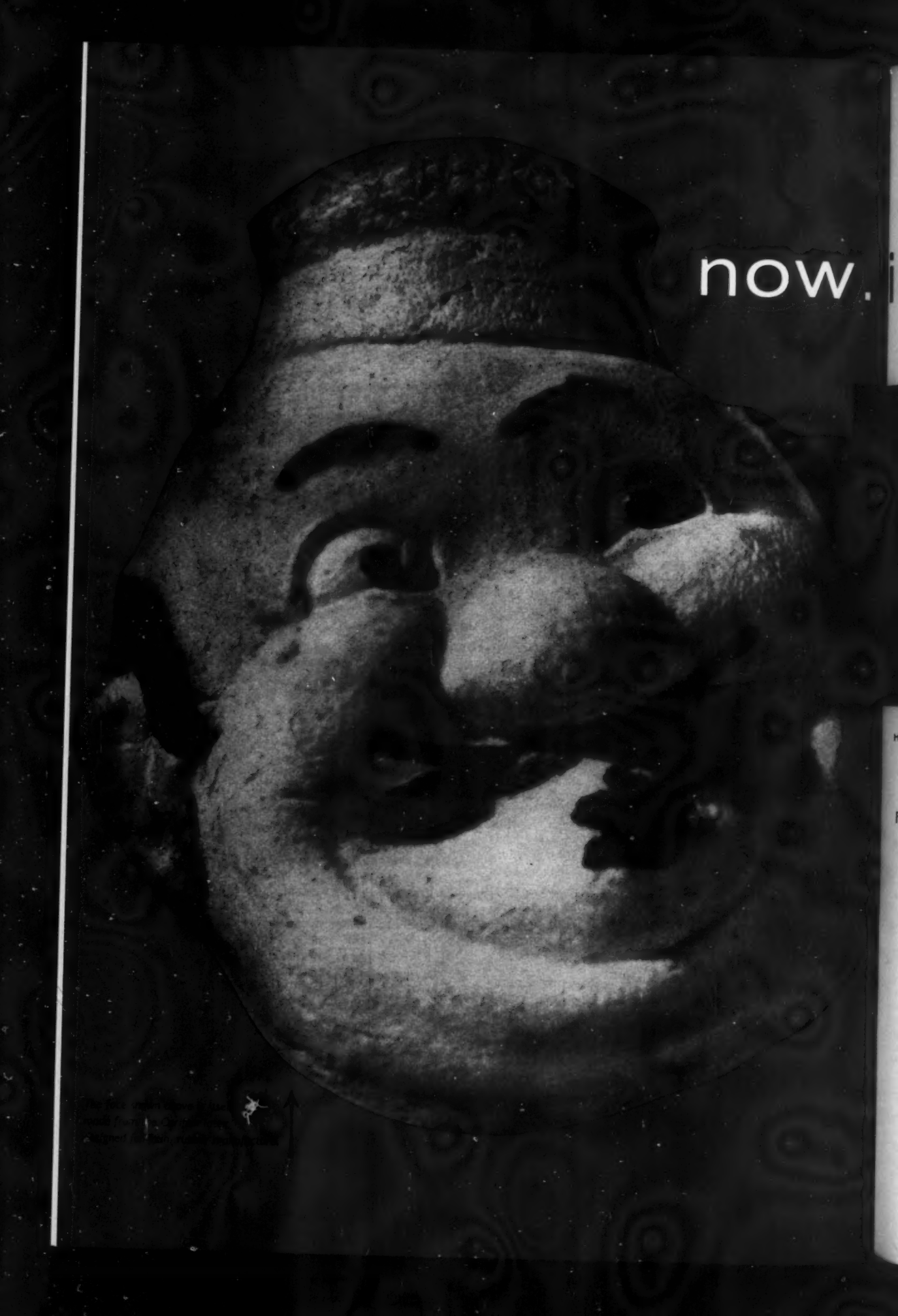
The rôle of the central Safety Department is described in the 'Review,' and I suggest that this section is well worth close study by other organizations; here I can do no more than barely outline some of its functions. Thus, it maintains close liaison with other departments concerned with technical aspects of production, sales and service, and, 'in this way many potential hazards are eliminated at the design stage.' It also keeps in close touch with outside organizations such as the Royal Society for the Prevention of Accidents and the Association of British Chemical Manufacturers. Two journals (the 'Safety Bulletin' and the 'Safety Standard') are regularly published within the company, and the latter reaches some 7,000 foremen and supervisors. To conclude, here are a few very brief abstracts from the 'Review'—by no means exhaustive—of the 'Prevention of Accidents' article:

Every lost-time accident is the subject of an enquiry. . . . An important feature is that all concerned should clearly understand that the purpose is to establish the facts, regardless of questions of liability.

After the taking of all possible practicable measures, however, 'the human element remains.' Safety is, in large measure, the result of a proper attitude of mind. In industry, as in everyday life, carelessness, or momentary preoccupation with private cares, can be the cause of an accident. . . . It is hard to see how this element can ever be completely eliminated, but the company's experience is that its consequence can be much reduced by 'an energetic campaign to make every individual employee take a positive interest in safety matters.' This, *e.g.*, by way of films, posters, talks, etc., to impress the need for care.

The references to I.C.I.'s Industrial Hygiene Research Laboratories (established in 1947), and the applications of their work; of the influence of good plant design, of protective clothing, of medical supervision, and the like, conclude this fascinating article.

PHILIP SCHIDROWITZ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Questions Corner—70

(Second Series)

299. What reactions occur leading to the degradation of PVC when it is subjected to heat and light?

300. What steps may be taken to minimize the degradation of PVC?

301. Silicone release agents are used in industry. What are their advantages?

302. What are the principal processes used for the manufacture of hardboard?

(Answers next week)

Answers to Questions Corner—69

295. The commercial polymerization of polystyrene may be by bulk polymerization or by a continuous process. In the bulk method, a viscous syrup is prepared, containing 40-60% solids, in kettle under atmospheric pressure, with paddle type agitators, and the polymerization of the syrup completed at higher temperatures than is used in making the syrup.

The catalyst may be added to the syrup, and it has been noted than benzoyl peroxide is not very satisfactory as it gives rise to yellowing of the polymer. The unchanged monomer is then separated from the polymer by evaporation, or by continuing the polymerization until virtually completed.

Continuous methods of polymerization have also been developed, and one of the earliest methods consisted in first producing a syrup by heating uncatalyzed styrene in aluminium kettles at 80°C. for 48-65 hours. The syrup then containing about 40% polymer was passed to the top of a cylindrical tower and allowed to flow down, over a period of 24 hours, through three zones at temperatures of 110, 150 and 180°C. (GP 634,278; USP 2,077,542.)

Another continuous method was developed (USP 2,530,409; BP 683,329) and consists of a horizontal screw conveyor. The syrup, prepared at 92°C., was heated in four zones at temperatures from 120-180°C., and the hot mass forced to fall in thin streams through an evacuated chamber to remove about 5% of the monomer. (See also USP 2,345,013; 2,500,728.)

Various other devices have been tried but with little commercial success, *e.g.*, the syrup is flowed on to a conveyor belt to remove the monomer (USP 2,283,539), the hot syrup is sprayed into a hot inert gas and the polymer, in the form of beads, collected on a revolving drum (GP 693,889).

296. In the condensation of certain materials with formaldehyde as the reaction proceeds more OH groups are eliminated and the product becomes increasingly less soluble in water, and the resin phase and the water phase separate. The water solubility can be determined in terms of temperature or in the amount of water that can be tolerated in the system at the point when separation begins to occur.

Temperature. As the reaction proceeds water tolerance decreases, and if a small amount of the resin syrup is diluted with a large amount of water, the resin separates. A convenient method of carrying out this test is to add one or two drops of the resin syrup to a test tube half filled with water and maintained at a given temperature. The temperature at, or below which, a white streak appears is known as the hydrophobe temperature. This temperature rises as the polymerization proceeds.

Water Dilution. In this test a sample is taken from the reactor and cooled immediately. When it has cooled to room temperature a 5 ml. sample is pipetted into a small beaker and titrated with distilled water until a faint haze appears. The number of ml. of water, divided by 5, is the water dilution of the sample. As the reaction proceeds the water dilution falls and reaches a minimum. When the resin phase begins to separate then the method is no longer of use.

Cloud Point. Another method for determining the progress of the reaction is to determine the temperature at which the first turbidity appears, due to separation of water, when the reaction mixture is cooled. Take a 10-15 ml. sample of the reaction mixture and place in a test tube, fitted with a thermometer and stirrer. Allow to cool with rapid agitation until turbidity appears. If the reaction conditions are held constant the cloud point is approximately a linear function of the reaction time.

297. It has been pointed out by Drusedow and Gibbs (Mod. Plast., June 1953, *30*, 123) that an ideal straight chain polyvinyl chloride should have good thermal stability and not readily split of hydrogen chloride when heated. Unfortunately, there are irregularities in the polymer, depending on the conditions of polymerization, and double bonds are formed which create a weakness from which decomposition may start. By removing one mol. of hydrogen chloride from the molecule, a C-C double bond is formed, and as more and more hydrogen chloride is removed a series of conjugated double bonds is formed.

In addition, oxidation may also occur at the double bond and carbonyl groups formed which contribute to the deepening of the yellow colour produced. Again, degradation may continue as cyclization and cross-linking, giving rise to carbonization. The presence of the polyene structure and carbonyl groups have been established by ultraviolet spectra of heat degraded polyvinyl chloride, while cyclization has not been definitely established experimentally (see Ind. Eng. Chem., 1949, *41*, 1775).

Impurities in the resin resulting from the polymerization process may cause a kind of 'trigger' action to occur. In an attempt to explain the instability of polyvinyl chloride once the loss of hydrogen chloride has begun suggests that the loss of one hydrogen chloride molecule, *e.g.*, from a point of branching, makes the nearest chlorine an allylic chlorine which is more active than an isolated chlorine atom.

The role of oxygen is not well understood, but it can bleach polyenes. The hydroperoxides formed as intermediates from the double bonds reduce the intensity of the colour produced by the strong chromophoric polyenes by interrupting the sequence of double bond systems. These hydroperoxides are thermally unstable and tend to decompose of carbonyl groups which, once formed, catalyze the degradation (Rub. Chem. & Tech., 1942, *15*, 756).

This thermal degradation has been studied in both oxygen and nitrogen and both the amount of hydrogen chloride and the amount of water evolved were determined. In the presence of oxygen fairly large amounts of water were obtained, but negligible in the case of nitrogen (J. Chem. Soc. Indus. Chem. Sec., 1955, *58* (6), 472).

298. Where a laminate is required made from cellulosic film it is usually to be doubled to some other material, and this is undertaken by the converter in high-speed machines. It is obvious, also, that an adhesive will be required except in the case of laminates composed of cellophane and polythene. Rubber-based or vinyl-based resins are usually satisfactory and such adhesives are applied by one of several coating techniques: (a) Knife coating; (b) reverse roller coating; (c) direct roller coating; (d) gravure coating.

The adhesive may be a hot melt, emulsion or a lacquer type, and in the case of the last two types the coated film is passed through the drying tunnel to drive off most of the solvent or water, and then double to the other material while it is still warm. Sometimes when using an emulsion, if a porous paper is being doubled to a cellulosic film drying can be made after doubling.

In the case of hot melts, oven drying is not necessary and therefore higher speeds can be achieved. Cellophane can be laminated directly to polythene by extrusion lamination without the use of any adhesive. In this case molten polythene, as it comes out of the flat extrusion die, is laid directly on to the cellophane film and then passed through chilled doubling rolls.

Various combinations are standard in the industry, and typical examples are: (a) Cellophane-polythene which gives laminates of good tensile strength; (b) polythene-cellulose acetate for lower moisture permeability; (c) paper-cellulose acetate for improved grease resistance.

(More questions next week)

MEN and MATTERS

A Review of People and Events

by George A. Greenwood

ON Monday *The Times* published a 12-page supplement, impressively illustrated, on the rubber industry. It contained over 30 contributions from many of the best-known business men and technicians, especially the latter. Its special significance seemed to me to be that it gave the general reader, who normally hears or sees very little in detail about the great basic industries, a chance of learning from the best authorities what it is all about, and how the commodities and the articles he or she buys, handles, and uses, from tyres to flooring, and from belting to shoe soles, are brought into this general use.

If it is a fact, as some readers might think it is, that the Supplement devoted a little more attention to the development of synthetics, as contrasted with the raising and treatment of natural rubber from the plantations, a reasonable and perhaps valid answer would be that, after all, this has become a landmark in the industry. An editorial note, for example, said that 'last autumn, without any public formalities, the production of SBR—the standard type of synthetic rubber used for tyres—started in Britain at Hythe near Fawley,' and in a special contribution headed 'Making Production Flexible,' Mr D. A. Bennett remarked that 'the most important single development in the British rubber industry since the war has been the very recent establishment of large-scale synthetic rubber production in Great Britain.'

At the Plantations

While all this is interesting and true as pin-pointing the silent revolution which has been going on within a period of less than 20 years, and to that extent is of special interest to the general reader, I must hasten to add that Mr G. M. Knocker, so well known to many of us, told the story of the enormous developments in the growing of rubber under the title of 'Plantation Rubber at 1s. a lb.?' and described in interesting detail what has been done, especially in Malaya (or to be more exact the territories comprising the new Federation), to increase production by intensive planting.

I myself found Mr Jasper Frankenburg's contribution under the title 'Growth of an Industry,' not only absorbing but also extremely informative, and just the same could be said of the article by Dr W. C. Wake on the wedding of rubber to textiles. Our own Dr H. J. Stern wrote under the title 'Unusual Protection,' most interestingly on this subject about which he knows so much, and for the man (or should it be woman) in the street, Peta Fordham told all she knows about what we do with rubber in the home.

The most remarkable thing about the 12 pages of this supplement is that it was probably as acceptable and as useful to the industry as it was to the proverbial Dick, Tom or Harry, and to that extent we are surely getting on.

US Rubber International

Mr Carroll J. Palmer has been appointed managing director of US Rubber International (Great Britain) Ltd., as successor to Mr R. D. Hunt, who at the beginning of the year became deputy managing director of The North British Rubber Company.

CARROLL J. PALMER

US Rubber International in London handles all of the exports of the Scottish firm.

Mr Palmer has come to his position in London following five years in Brazil as director president of US Rubber International do Brasil SA. He began his career with United States Rubber Company at the Providence Plant in Rhode Island, USA, in 1936, and has been in overseas assignments for the company since 1940.

Materials Handling

Materials handling problems arise in every branch of manufacturing, transport and warehousing, and it is in the national interest that solutions to these problems should be found by a scientific and informed approach leading to higher labour and capital productivity. It has been brought to my notice that the National Joint Committee on Materials Handling, a body on which are represented over twenty professional and kindred societies concerned with various aspects of the subject, feels that it may be able to assist secretaries of societies and other bodies drawing up their programmes for the 1959/60 sessions, by suggesting suitable subjects for lectures and possible lecturers. Further information may be had from the Secretary at 69 Cannon Street, London, E.C.4. Telephone City 4444.

Standard Or . . .

Rumours continue regarding the 'take-over' bids for the Rover Car Company. As well as Standards, Rootes, BMC and the American Willys - Overland are reportedly interested. I am not one ordinarily to stick my neck out but my spies tell me that the odds are on a Standard-Rover merger.

Plastics Exhibition

When a golfer is 'off his game' the cause may be damp atmosphere rather than a temporary loss of skill!

Tests have proved that moisture absorbed from the air causes distortion and keeps changing the face angle of any wooden golf club head. Even one degree of misalignment can make a perfectly stroked ball veer off 40ft. in a 225yd. drive. A new kind of golf club which eliminates such distortion will be shown at the International Plastics Exhibition at Olympia, London, in June, on the stand of the Anchor Chemical Co. Ltd.

Made from a new plastic so tough that it can be used for cartridge and shell cases, these heads are entirely moisture proof and their shape never varies, no matter how soggy the

atmosphere! They are more durable than wood yet give the same 'feel' and 'click.' Moulded plastic golf club heads have another advantage—every one is exactly alike, whereas conventional clubs vary with the natural characteristics of the wood.

Other applications for this remarkably rugged plastic include roller and ice skates, shoe heels, safety helmets and covers for motor mowers.

Back from Australasia

In the February 28 issue of *RJIP* I mentioned the departure for Australasia on a business tour of Mr H. J. Hornsby, commercial manager of the International Synthetic Rubber Co. Ltd., Hythe, Southampton. He went principally to visit tyre manufacturers and industrial companies to discuss the many new applications of synthetic rubber in industrial production.

Mr Hornsby has now returned to this country and he says that buyers in Australia and New Zealand were impressed with ISR's interest in their markets, as well as their ability to guarantee a continuous supply from a sterling source.

Mr H. J. Hornsby, *second from left,* **shows photographs of his company's plant to,** *left to right,* **Mr A. Collins, Dunlop Rubber Australia Ltd., Mr J. R. Smithson, of the Olympic Tyre and Rubber Co. Ltd., and Mr I. A. Pittman, of L. J. Herman and Co. Pty. Ltd.**

Hitting the Jackpot

I have just been hearing of an almost fairylike incident in the world of investment which is only incidentally linked up with rubber, but at least sufficiently so for us to consider it. A few days ago three women investors, obviously with a certain amount of understanding and *nous,* suddenly became richer by thousands of pounds, and all because, as one of my friends 'in the know' put it to me, they had claimed a woman's privilege to be contrary!

Many of you will remember the take-over bid for the old Bukit Lintang Rubber Estates at 7s. 6d. a share, made by Mr Maxwell Joseph, that very bold and enterprising West-End hotelier and property man, who obviously knew what he was doing. But so, apparently, did these three ladies with whom we are at the moment concerned.

Mr Joseph with all his aplomb, and his long-term view, transformed the old Bukit Lintang Company into a new property holding company and into it he put London's Dolphin Square. Now we come to exactly what happened. There were, altogether, 45 old investors in Bukit who declined Mr Joseph's 7s. 6d. 'bait' and held on. Now, they and we see how wise they were, for these 45 have seen their original investments grow almost beyond the dreams of an investor's avarice.

One, Miss May Davis, of Carshalton, Surrey, has seen her money last valued at £337, suddenly grow into £6,200. Mrs Marie Anderson, of Dulverton, Somerset, has seen her £375 mushroom into £6,900. But Miss Nellie Simonds, of Wallington, Surrey, has been the luckiest of all. Her £750, which she held on to against Mr Joseph's bid, has become a fortune of over £14,000! I am told that all of them have been shareholders in the old Bukit Lintang for years, and we must admit that even in those earlier days they did not do so badly from the proceeds of rubber.

I suppose there is a moral in all this, and it is particularly applicable at a moment when more and more rubber companies, whilst still remaining in the industry, but also expanding their interests in other directions, could easily become the objects of these apparently at the moment attractive offers. The moral? Well, surely, it is that it often pays to be the odd man out, in spite of glowing temptations fluttered before our eyes.

The Bootle Affair

You will have noticed that because of a dispute between two trade unions of importance to which I have already referred in its earlier stages, work has been brought to a standstill at the plastics factory at Bootle, near Liverpool, of Plastics Reinforced (Liverpool) Ltd. The factory opened a few years ago by Mr Charles W. Barclay, formerly an employment exchange manager, at one time had more than one hundred people but because of the uncertainties created by the dispute the last twelve remaining have had to be discharged.

The trouble is really between the Confederation of Shipbuilding and Engineering Unions' two associates, the Transport and General Workers Union and the General and Municipal Workers Union. Although there is apparently an agreement between them that plastics workers may belong to either, the Amalgamated Society of Woodworkers has stepped in and persuaded the female labour at Bootle to join it, at the same time threatening Mr Barclay that if he did not agree, and toe the line, all his company's products would be 'blacked' throughout the country, and the factory closed down.

Mr Barclay says that the dispute has already cost his company £20,000, and that is serious enough. But it is not the main issue. I have made some enquiries, and I find, or at least I am assured, that the agreement between the two great unions about the organization of plastics labour holds good. I mention this because it is obviously of the utmost importance that every firm and company engaged in the plastics industry, and employing labour, should know the facts, although, obviously it is in the main an issue for the trade unions themselves to resolve. What I do not personally understand is that a comparatively small union like the Amalgamated Society of Woodworkers can ride roughshod over a national agreement with an immense body like the Confederation of Shipbuilding and Engineering Unions.

Mr E .Stekel has been appointed to the board of Mambau (FMS) Rubber Co.

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Companies in the News

William Warne (Holdings) Ltd.

In his statement to be presented at the annual general meeting of the company on May 7 Mr H. H. S. Hillier, chairman, says:

The recession in industry during 1958 resulted in increased competition for the smaller volume of business available and as the year progressed we found trading conditions becoming rather more difficult than in 1957. We were however able to obtain a moderate increase in turnover in the case of both William Warne and Co. Ltd. and the St. Albans Rubber Co. Ltd. The trading results of Warne's continued to be satisfactory and were better than in the previous year. In the case of St. Albans, partly as a result of increased sales and partly as a result of certain reorganization, there was a substantial increase in profit.

The small reduction in the dividend paid in respect of 1957 was mainly due to the high rate of tax payable on distributed profits and the Board are now making an increased distribution by paying 2½% as a special interim dividend for 1959.

The accounts show that the net trading profit of the Holding Company increased from £317,870 to £376,766. The net profit after tax is relatively even more favourable, £176,524 against £139,661, as a result of the improved Profits Tax position.

Imperial Chemical Industries

According to the review of activities of Imperial Chemical Industries Ltd., which accompanies the annual report and accounts, the group's sales of plastics rose by 8% last year, even though Japanese and other foreign manufacturers were making heavy inroads in the domestic market for some products, particularly polyvinyl chloride. But this section of the industry is no longer increasing its output at the high rate of recent years, although a number of chemical manufacturers are planning to add to their potential output of plastics in the next year or two. Manufacturers on the Continent are also adding substantially to their capacity this year, so that the market is expected to become steadily more competitive. One of the ways in which I.C.I. is trying to increase its sales, despite the greater competition, is by the policy of bulk delivery which it describes as 'particularly successful' in export markets. Group home and overseas sales in 1958 totalled £462,677,074 and the group trading profit was £51,500,198. Income after taxation is £17,634,441. I.C.I.'s plans include the raising of polythene capacity to over 90,000 tons a year and the building of a polypropylene plant at Wilton. To meet the anticipated growth of demand for Terylene, the Wilton plant is to be expanded to a capacity of 50m. lb. a year from the present level of 30m. lb. Further plans include a new spinning factory in Northern Ireland. But last year sales of Terylene fibre fell as a result of the general decline in the textile industry and the running down of stocks.

Harrisons and Crosfield Ltd.

The directors have declared an interim dividend of 5% (actual) in respect of the financial year ending on June 30 1959 on the deferred ordinary stock, payable on May 28 1959.

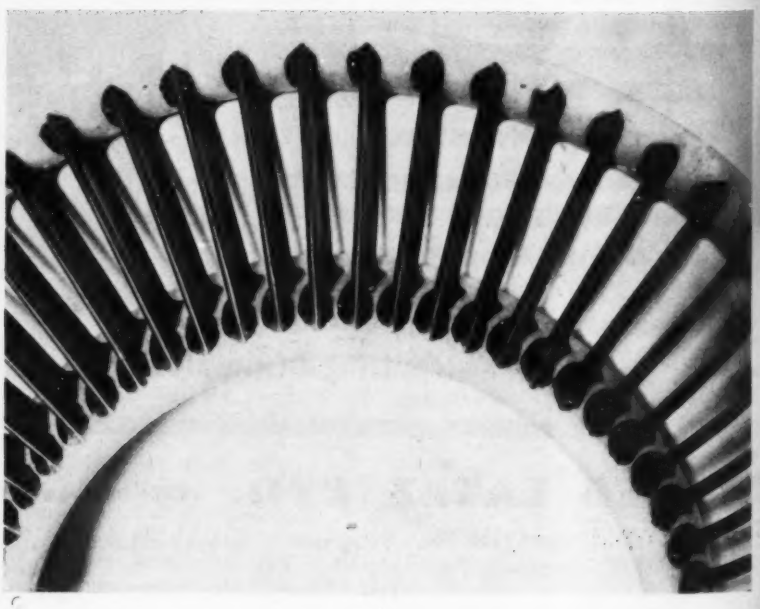
Mr W. R. Northcott has been elected a director of English China Clays.

E. B. Skinner

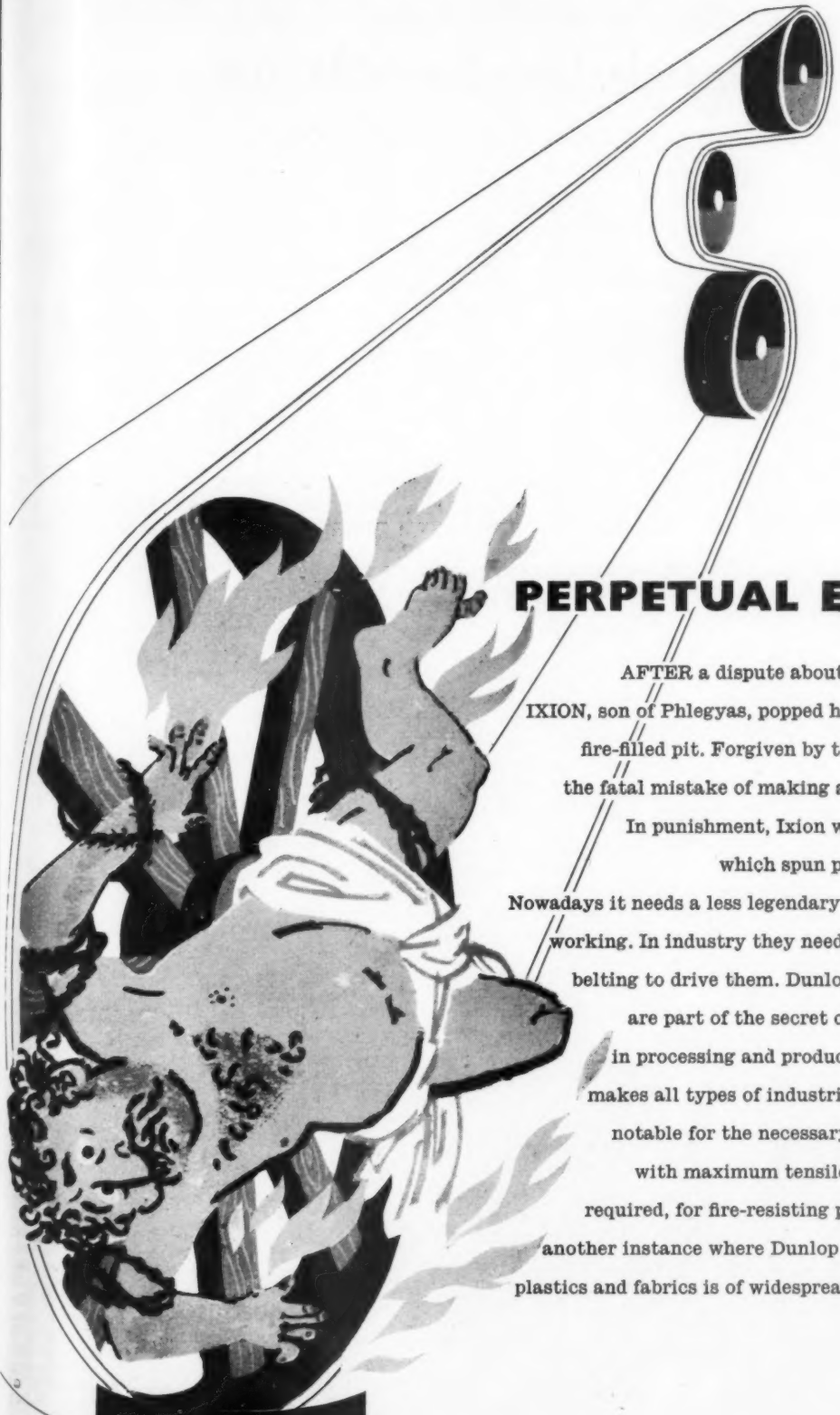
The death occurred on April 20 at his home in Wokingham, of Mr E. B. Skinner, one of the pioneers of rubber planting. Mr Skinner, who was well known in the rubber industry, became associated with it at the beginning of this century when he served with a number of rubber planting companies under the SIPEF Straits Agency. He was appointed to the board of the Rubber Estate Agency Ltd. in 1919 following its merger with SIPEF, Antwerp, and he eventually became vice-chairman of REA. He retired from the board in October 1956.

During his business life Mr Skinner was a director or chairman of a large number of rubber planting companies. Until July 1958 he was chairman of the Kuala Lumpur Rubber Co. Ltd., the Bukit Tupah Rubber Estates Ltd., and the Tambira Rubber Estates Ltd., and previously he had been chairman of the Batu Kawan Rubber and Coconut Plantations Ltd., the Tanjong Malim Rubber Co. Ltd., Java Rubber Plantations Ltd., and Tamiang Rubber Estates Ltd.

Mr Skinner had also been associated, as director or chairman, of a number of other companies which have now been amalgamated or changed their names or business. These were: Junun Rubber Estates Ltd. (now Amalgamated Bukit Tupah); Prye Rubber and Coconut Plantations Ltd. (Amalgamated Batu Kawan); Remfield Rubber Estates Ltd. (now Remfield Trust Ltd.); Sempah Rubber Estates Ltd. (now Sempah (Holdings) Ltd.); and Sungei Chermang Rubber Co. Ltd.



Opening last week of the Westland Aircraft Co.'s London 'Heliport' makes topical this picture of the swirl vanes in the Whirlwind helicopter. Fabricated from 'Duramat' chopped strand mat made by Turner Brothers Asbestos Co. Ltd., the swirl vanes, 57 of which are located in the inner and outer ring assembly, are housed in the engine bay of the machine. These vanes direct the cooling air supply from a large fan on to the engine, to ensure even cooling of the engine and its components. Up to September 1958 the swirl vanes and mounting rings were of metal



PERPETUAL EMOTION

AFTER a dispute about the wedding presents IXION, son of Phlegyas, popped his father-in-law into a fire-filled pit. Forgiven by the gods, he then made the fatal mistake of making a pass at Zeus's sister. In punishment, Ixion was chained to a wheel which spun perpetually in mid-air. Nowadays it needs a less legendary power to keep wheels working. In industry they need Dunlop transmission belting to drive them. Dunlop conveyor belts, too, are part of the secret of "perpetual motion" in processing and production. Dunlop, in fact, makes all types of industrial belting, each being notable for the necessary flexibility combined with maximum tensile strength and, where required, for fire-resisting properties. This is yet another instance where Dunlop experience in rubber, plastics and fabrics is of widespread service to industry.

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CTH/PRS9/17

BPF Jubilee Luncheon

PLASTICS INDUSTRY STILL EXPANDING

'TWENTY-FIVE years ago the plastics industry was of minor national importance, but today there is scarcely an industry in the country which does not employ plastics in some form or another.' This was one of the points made by Mr N. B. Punfield, chairman, at the Silver Jubilee Luncheon of the British Plastics Federation, held on April 22 at the Dorchester Hotel, London. The lunch was attended by well over 400 people and the guest of honour was Sir Cyril Musgrave, K.C.B.

In proposing the toast of the guests, Mr Punfield said that this was the Silver Jubilee year of the British Plastics Federation, and it was right and proper that they should pay tribute to those far-sighted gentlemen who came together and formed this Federation 25 years ago. He wondered whether they foresaw what a large and important industry plastics would become in 25 years' time. It was satisfactory to realize that some of these founders of the Federation were not only with them at this gathering but were still actively engaged in the industry.

Applications

Returning to the main subject of his address, Mr Punfield said that apart from the large range of household articles, toys, fancy goods and other finished products entirely of plastics, the trade in plastics components for such industries as radio and television, gramophone records, motor cars, refrigerators, electrical and engineering, was now very large and still expanding. One direction in which the use of plastics, particularly polythene, had greatly increased, was in the pre-packaging industry. Today there were 350 pre-packaging stations turning out 200 million pre-packaging packs per year, and it was quite certain that this side of the industry would continue to grow. An interesting application in pre-packaging was the packing of potatoes in polythene coloured black, to prevent them 'greening.' One company alone at Ely in Cambridgeshire was packing 40 tons of potatoes a day in polythene bags. Other industries in which the use of plastics was increasing were building, ship and boat building, and the shoe trade.

The relaxation in hire purchase controls and the more recent reductions in purchase tax were certain to increase the demand for all types of plastics in the home market.

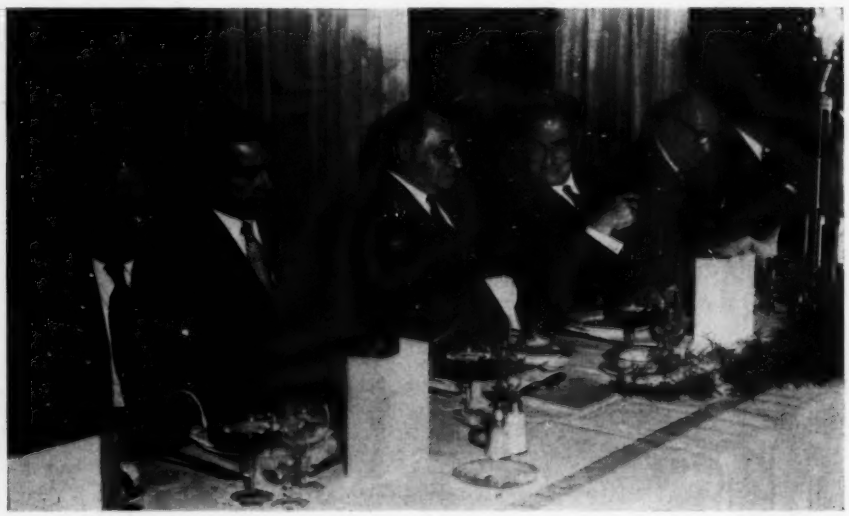
The great increase in the production of plastics articles had, of course, necessitated a great increase in the production of plastics materials. Last year he was able to report that the tonnage of the plastics materials had again expanded, and he was now happy to be able to tell them that this expansion continued. The production of plastics materials in 1958 reached a figure of about 410,000 tons, which was about two and a half times the production in 1950, and about sixty times that of 1937.

'The export of plastics materials last year reached a figure of 122,651 tons, worth over £32m. This compares with 21,000 tons in 1947 and 4,300 tons in 1938. In 1957 plastics materials exports represented 11.2% of all chemical exports. I have not been able to obtain the percentage figure for 1958, but I am reliably informed that it would show an increase.'

From these figures it would be clear that plastics were now an important exporting industry, particularly when it was realized how many plastics articles, either complete in themselves or as components of other articles, were also exported. Also to these figures must be added plant and machinery, of which there was a considerable export.

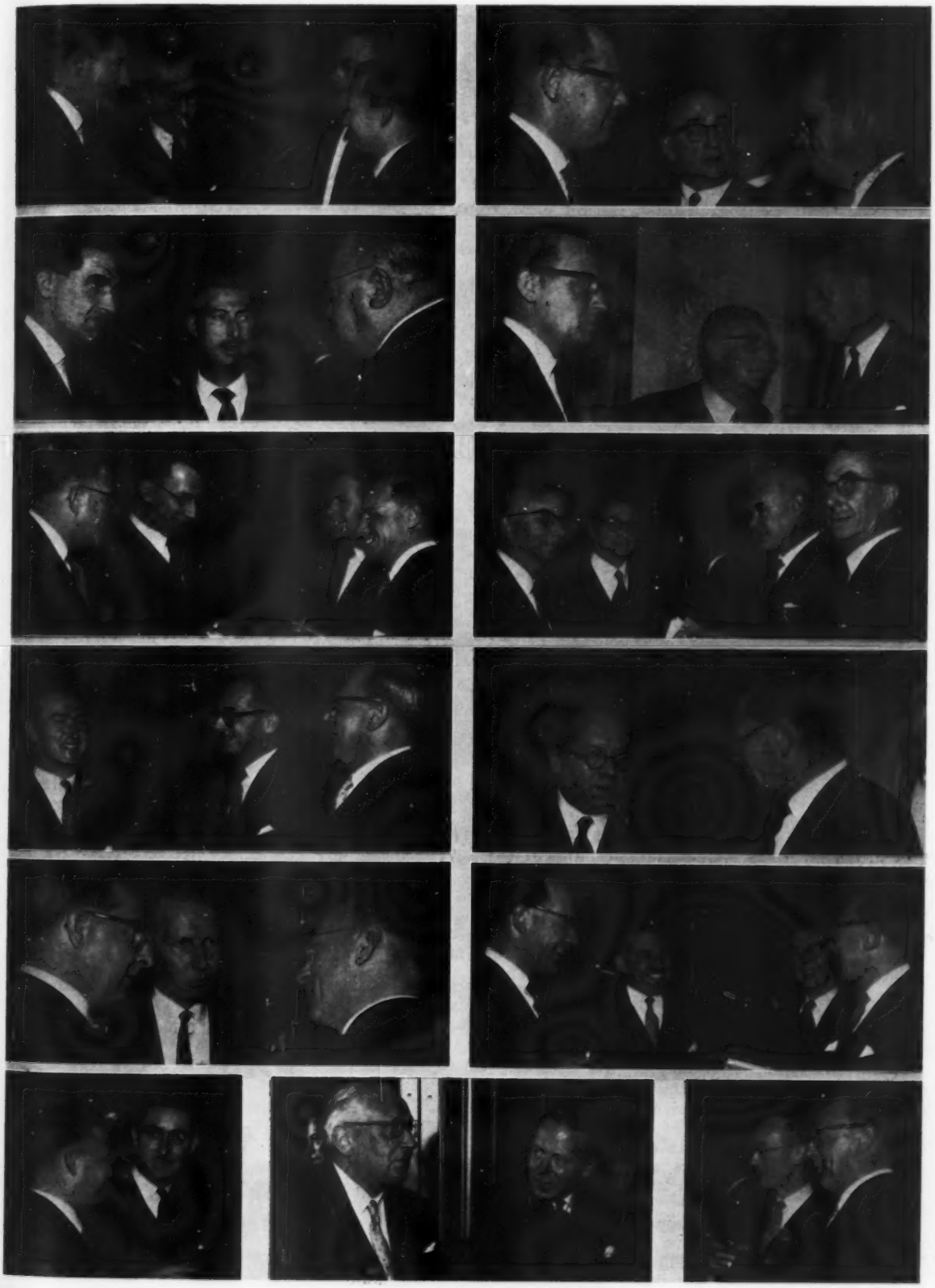
The Future

What then of the future. It seemed certain that they could expect a continued rapid growth for at least the next decade. During this year there would come into operation two new high density polythene plants, each rated to give a production of 11,000 tons per year, and amongst the newer materials polypropylene was now being produced in this country. It was very satisfactory to note that they were rapidly reaching self-sufficiency in the production of plastics materials. The rapid growth of the industry had



Some of those present at the British Plastics Federation's Silver Jubilee luncheon are seen in this view of the top table. *(Left to right)* **C. C. Last; R. Barrington Brock, president, Scientific Instrument Manufacturers Association of Great Britain; C. H. Glassey, president of the Federation; Sir Cyril Musgrave, guest speaker; N. B. Punfield, Federation chairman, and J. Frankenburg, president, Federation of British Rubber and Allied Manufacturers**

BRITISH PLASTICS FEDERATION SILVER JUBILEE LUNCHEON — MORE PICTURES



naturally entailed increased activity and work in the Federation.

During 1958 a new group was formed for reinforced plastics. This group had proved most successful, and had held a technical conference which attracted an attendance of over 400, and had brought a number of new members into the Federation. A new Fluorocarbons Section had also been formed within the Fabricators Group.

The Federation now had 38 technical committees which prepared reports for the members and specifications for submission to the British Standards Institution. Ten specifications were sent to the BSI during 1958. The Federation had also continued to deal with the increasing number of telephone and postal enquiries through its information bureau and provided a first-class library and abstracting service. The Federation's second biennial conference was held in Torquay last September and again proved a very great success.

There was an improved entry last year for the Annual Award by the Worshipful Company of Horners, for the best design of a plastics article, and he was very pleased to say that there was an increasing interest in this award in the current year. The Federation was sponsoring in October a combined stand at the Düsseldorf Plastics Exhibition, and was exploring the possibility of a similar stand at the New York Trade Fair in 1960.

Plastics Exhibition

This year there would again be an International Plastics Exhibition at Olympia, sponsored by 'British Plastics,' and in addition to having the largest number of British exhibitors so far, it would also have an increased number of foreign firms showing. The Federation would, of course, have an enquiry stand at that Exhibition.

A number of Press conferences had been organized from time to time to publicize achievements of committees of the Federation as and when they occurred. Through the Press officer, Mr Andrew Reid, the Publicity Committee arranged for the provision of Press articles on plastics, both for the national and trade Press. Mr Punfield said he would like to thank their trade Press for the very valuable assistance that they had rendered, and were continuing to render the Federation by their co-operation. He was also grateful to the members and friends for turning up in such large numbers.

It was his very pleasing duty to extend a very hearty welcome on behalf of their members to all visitors. It was gratifying to note that their three past presidents, Mr C. F. Merriam, Mr Charles Waghorne and Mr Howard Potter, and also their old friend and past chairman, Mr W. M. C. Norie was with them once again. They were also pleased to have with them that day the president of the Plastics Institute, Dr J. C. Swallow, and the chairman of the Trustees Plastics Industry Education Fund, Mr C. S. Dingley, both of whom were very old friends of the Federation. They were further honoured by the presence of the Master and Clerk of the Worshipful Company of Horners, in the persons of Mr H. W. Lancaster and Mr T. F. Clarke.

They welcomed Mr George Brearley, Director of The Association of British Chemical Manufacturers; Mr G. S. Bache, President of The British Chemical and Dyestuffs Traders Association; Sir Gordon Russell, Director of The Council of Industrial Design; Mr Jasper Frankenburg, President of the Federation of British Rubber and Allied Manufacturers; Mr P. W. Howard, President, and Dr W. F. Watson, Director, of The Research Association of British Rubber Manufacturers; Mr R. Barrington Brock, President of the Scientific Instrument Manufacturers Association of Great Britain; Mr C. E. Hollis, Chairman of the Plastics and Polymer Group of the Society of Chemical Industry; Sir Frank Lee, Permanent Secretary of the Board of Trade; Mr G. J. MacMahon, of the Industries and Manufactures Department of the Board of Trade; Mr W. Strath, Permanent Secretary of the Ministry of Supply; Mr Claude Wallis of Iliffe and Sons Ltd.; Mr R. E. Dangerfield, Temple Press Ltd.; Mr E. W. Russell, Dr M. G. Church and Mr B. T. Boswell of the Ministry of Supply; Mr A. S. H. Saville and Mr J. C. Fletcher of HM Customs and Excise; Mr S. L. Edwards, Mr H. F. Heinemann and Mr D. N. Charlish of the Board of Trade.

Sir Cyril and the BPF

'Finally,' said Mr Punfield, 'I would express our gratitude to our principal guest, Sir Cyril Musgrave, for honouring us with his presence today, and agreeing to speak. Sir Cyril Musgrave is no stranger to us, he was with us last year when he was Permanent Secretary to the Ministry of Supply and has had a long and distinguished career as a member of the civil service.'

Response

Sir Cyril Musgrave responding to the toast of 'The Guests,' said that when he received the invitation to the Jubilee Luncheon he was still at the Ministry of Supply. When, later, after accepting the invitation, he became chairman of the Iron and Steel Board he debated whether he ought to ask to be excused—'because I had become connected with an industry with which yours is, to some extent, in competition.

'But after careful reflection I came to the conclusion that a speech of mine could hardly be an asset to the plastics or any other industry and that indeed you were probably doing yourselves a lot of harm in choosing me as your speaker.

'Not that I wish the plastics industry ill. On the contrary I have gone to great pains to clothe myself properly for I am wearing a Terylene shirt and Terylene tie. I am also wearing nylon socks—and that is probably why I have cold feet as I stand here.

'I realize, of course, that I might possibly have further still helped you in a sartorial sense, for I see in your 1958 report — and I here quote— "that the discussions on plastic bags have been brought to a satisfactory conclusion."

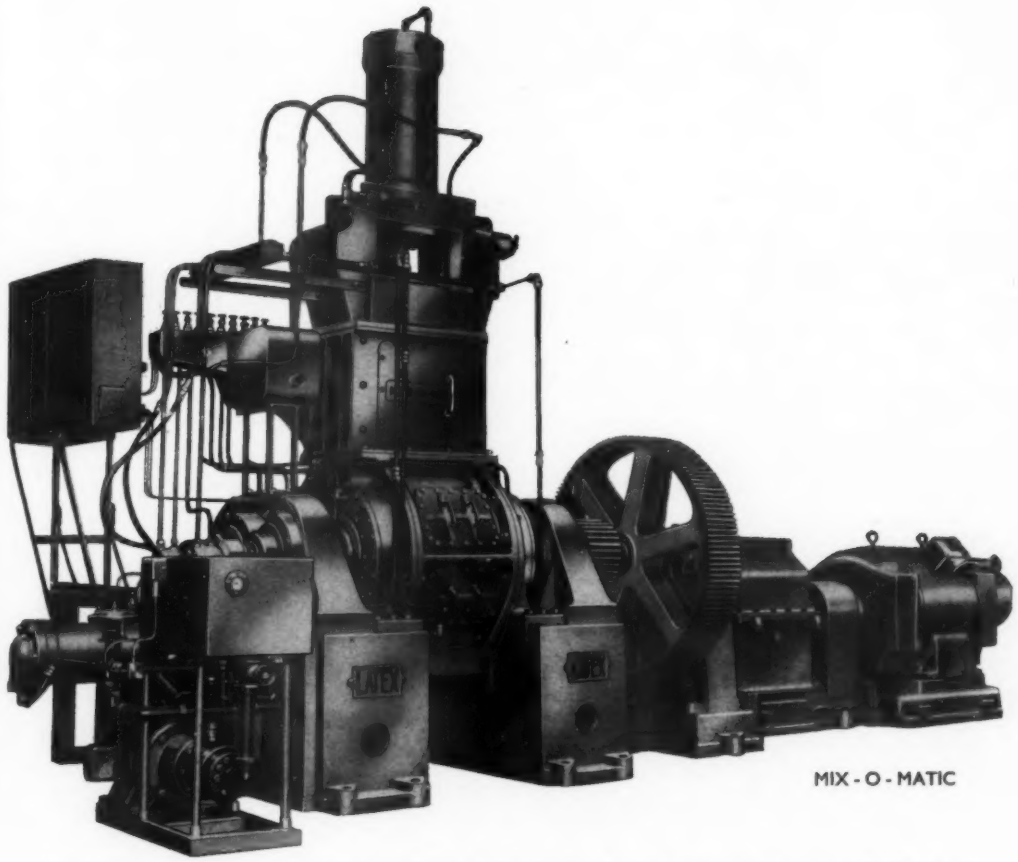
'But what attracted me most in accepting this invitation is that I saw it as an opportunity to pay tribute to an industry which owes its existence and its rapid expansion to scientific research and development.'

Continued on page 686

Polly Ester Says . . .

'Shape factor—something you get with a good corset'

THE BEST YET IN INTERNAL MIXERS



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Rubber Statistics

FRANCE — JAPAN — WESTERN GERMANY

THE latest bulletin issued by the Secretariat of the International Rubber Study Group brings the published information regarding the French rubber position up to the end of November last. During the eleven months ended November 30 France imported 113,205 tons of crude natural rubber and 11,996 tons of latex, making 125,201 tons in all compared with a figure of 131,843 tons imported during the same period of 1957.

The 1958 imports came mainly from Vietnam, with 55,627 tons, and Malaya, with 52,601 tons. In the earlier period, Malaya had supplied the greater tonnage, with 66,134 tons against Vietnam's tonnage of 40,459 tons.

Consumption of natural rubber during this period amounted to 116,017 tons of crude and 11,118 tons of latex, making 127,135 tons in all compared with 122,762 tons during the first eleven months of the preceding year. Stocks of natural rubber at the end of November stood at 14,125 tons of crude and 2,056 tons of latex, representing a decrease of some 3,500 tons in the case of the former, but an increase of some 900 tons in the case of the latter, compared with the stock position at the beginning of the year.

Imports of synthetic rubber during these months totalled 52,826 tons, and included 34,158 tons of S-Type rubber, 6,378 tons of neoprene, 9,264 tons of butyl, 1,804 tons of N-type rubber and 1,222 tons of synthetic latex. Of this amount, 33,242 tons came from the USA and 16,574 tons from Canada. During the comparable period of 1957, imports of synthetic had been some 6,500 tons less at 46,303 tons, with imports from Canada somewhat higher, but those from the USA only amounting to 25,719 tons.

Consumption of synthetic during these months totalled 49,707 tons, or some 3,000 tons more than in 1957, and of this amount 31,921 tons consisted of S-Type, 5,950 tons of neoprene, 9,040 tons of butyl, 1,676 tons of N-type and 1,120 tons of synthetic latex. Stocks at November 30 stood at 8,570 tons, an increase of about 3,000 during the course of the year.

Japan

The Study Group has also published details of the Japanese rubber position up to the end of November last.

During these eleven months, Japanese imports of natural rubber totalled 107,381 tons of crude and 9,105 tons of latex, making 116,486 tons in all, or some 3,000 tons less than the comparable 1957 total of 119,667 tons.

Consumption of natural rubber amounted to 106,390 tons of crude and 9,420 tons of latex, making 115,810 tons in all or some 5,000 tons less than the 1957 figure of 120,885 tons. Synthetic rubber imports into Japan during these months totalled 14,611 tons, an increase of about 2,000 tons, 11,258 tons coming from the USA, and 2,700 tons from Canada. Consumption of synthetic amounted to 14,750 tons compared with 11,990 tons and stocks of synthetic at the end of November stood at 2,731 tons compared with stocks of 2,870 tons held at the beginning of the year.

Western Germany

During the first two months of this year, West German production of rubber tyres was appreciably higher than production during the first two months of 1958, with 29,726 tons as against 23,599 tons. There was a 2,500 tons increase in January (14,094 as against 11,447 tons) and a 3,500 tons increase in February (15,632 tons as against 12,152 tons). Output in the individual sections of the tyre industry amounted to (in 1,000 units): bicycle tyres 2,308 (1,909), motor cycle tyres 154 (135), car tyres 1,597 (1,310), and lorry tyres 259 (166).

Year-end totals for synthetic rubber imports during 1958 are also announced. These amounted to 40,430 tons, with 33,396 tons received from the USA and 5,964 tons from Canada. Imports of natural rubber amounted to 121,822 tons, of which 57,598 tons came from Malaya and 28,113 tons from Indonesia.

Plastics Statistics

MARCH IMPORTS AND EXPORTS

ACCORDING to the official Trade and Navigation Accounts for March, UK imports of plastics materials during the month amounted to 3,557 tons, compared with 3,130 tons in March 1958. The values were £1,328,187 and £1,320,368, respectively. The major source was the US which sent 1,335 tons, worth £611,353, compared with 853 tons, worth £481,057 in the corresponding period of last year.

Exports of plastics materials during March totalled 12,496 tons, valued at £2,989,395, and compared with 10,179 tons, valued at £2,778,846. France took 1,346 tons, worth £329,215; Belgium, 677 tons, £169,922; The Netherlands, 604 tons, £148,321; and Sweden, 558 tons, £134,000.

Details of imports of plastic materials during March, with values, are as follow:

	Tons	Cwt.	£
Alkyd solid and liquid resins, solutions, emulsions and dispersions	159	9	31,927
Cellulose plastics:			
Photographic (including cinematograph) film base (except acetate butyrate)	130	2	170,401
All other	125	9	115,434
Polyvinyl chloride:			
Polymers and copolymers	630	7	122,492
All other	708		211,176
All other	1,803	15	676,757
Total	3,557	2	1,328,187

Exports of plastics materials in March, with values, were as follow:

	Tons	Cwt.	£
Acrylic sheet, rod, tube, film, foil and profile shapes in primary form	409	4	255,033
Aminoplastics:			
Solid and liquid resins, including solutions	1,173	13	167,266
Moulding and extrusion compounds	676	2	123,765
Cellulose plastics:			
Moulding and extrusion compounds	204	9	63,487
Sheet, rod, tube, film (excluding regenerated cellulose), foil and profile shapes in primary form	75	10	49,418
Phenolics and cresylics:			
Solid and liquid resins (straight and modified)	664	8	121,997
Other	378	7	162,948
Polystyrene	847	11	176,908
Polythene sheet, rod, tube, film, foil and profile shapes in primary form	288		90,107
Polyvinyl chloride:			
Polymers and copolymers	1,135	5	171,307
Moulding and extrusion compounds	1,109	3	196,176
Sheet	460	8	206,033
Other	59	18	15,452
All other	4,104	16	1,086,987
Waste and scrap	909	10	102,511
Total	12,496	4	2,989,395

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R.A.B.R.M. MANUAL No. 3

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HEAD of CHEMISTRY DIVISION
RESEARCH ASSOCIATION of BRITISH RUBBER MANUFACTURERS

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(e-qdp)—Ex-quay duty paid (cifUKdp)—cif UK duty paid (ddp)—Delivered duty paid
(e-sUK)—Ex-store UK (ex-wUK)—Ex-warehouse UK (d)—Delivered

SBR TYPES AND HIGH-STYRENE RUBBER

Ameripol (Goodrich Gulf) (e-qdp)
(min., 70,000-lb. lots)

1000 Hot, Non-Oil	23.10
1001 „ „	23.10
1002 „ „	23.34
1006 „ „	23.34
1007 „ „	23.34
1009 „ „	23.71
1011 „ „	23.71
1012 „ „	23.24
1013 „ „	23.94
1500 Cold, Non-Oil	23.10
1501 „ „	23.10
1502 „ „	23.10
1703 Cold, Oil-Extended, 25% oil	*20.31
1705 „ „ „ „	*20.07
1707 „ „ 37.5% oil	*18.89
1708 „ „ „ „	*18.89
1710 „ „ „ „	*18.66
1712 „ „ „ „	*18.66

* Under 70,000 lb., min. 600 lb.

ASRC (American Synthetic Rubber Corpn.) (cifUKdp*)
(carloads lots of 30,000 lb.)

1000 Hot, Non-Oil	23.99
1001 „ „	23.99
1004 „ „	23.99
1006 „ „	23.99
1009 „ „	24.61
1018 „ „	26.74
1019 „ „	26.26
1500 Cold, Non-Oil	23.99
1502 „ „	23.99
1503 „ „	26.02
3110 „ „	25.78
1703 Cold, Oil-Extended	20.69
1708 „ „	19.27

* US/£ conversion rate $2.80

Cariflex (Shell Chemical Company) (e-sUK)

S-1000 Hot	22.0
S-1002 „	23.375
S-1006 „	22.0
S-1009 „	24.0
S-1011 „	24.0
S-1013 „	24.0
S-1100 Hot/black	19.75
S-1500 Cold	22.0
S-1502 „	22.0
S-1600 Cold/black	19.625
S-1602 „ „	19.625
S-1605 „ „	19.375
S-1703 Cold, Oil-Extended	20.25
S-1706 „ „	20.0
S-1707 „ „	17.75
S-1709 „ „	17.5
S-1712 „ „	17.5
S-1803 Cold, Oil/Black Masterbatch	17.875
S-1804 Cold, Oil/Black Masterbatch	19.25

Copo (Copolymer) (cifUKdp)

1006 Hot, Non-Oil	23.25
1500 Cold, „	23.25
1502 „ „	23.25
1505 „ „	26.00
1712 „ Oil-Extended	18.50
1778 „ „	18.75
3900 „ Rosin-Extended	23.125

FR-S (Firestone) (cifUKdp)*

1000 Hot	23.187
1001 „	23.187
1004 „	23.187
1006 „	23.187
1500 Cold	23.187
1502 „	23.187
146 „	23.187
1703 Oil-Extended	20.125
1712 „	18.5
123 „	19.187
155 „	18.5
173 „	20.125
178 „	18.75
1009 Specialty	24.625
1010 „	25.812
1012 „	24.187
1013 „	24.875
1014 „	27.75
1015 „	28.75
141 „	28.625
158 „	29.562

*US/£ conversion rate $2.80

International Synthetic Rubber Co. (ex-wks)

Intol 1500	22
Intol 1502	22
Intol 1710	17.5
Intol 1712	17.5

Philprene (Phillips) (e-qdp*)

1000 Hot, Non-Pigmented	23.28
1001 „ „	23.28
1006 „ „	23.28
1009 „ „	24.69
1010 „ „	25.86
1018 „ „	26.80
1019 Hot, Non-Pigmented	26.33
1100 Hot, Pigmented	19.65
1104 „ „	19.28
1500 Cold, Non-Pigmented	23.28
1502 „ „	23.28
1503 „ „	26.10
1601 Cold, Pigmented	19.56
1605 „ „	19.28
1703 Cold, Oil-Extended	20.23
1706 „ „	19.94
1708 „ „	18.82
1712 „ „	18.58
1803 „ Pigmntd, Oil-Extended	17.78
1805 „ „ „	15.99

*US/£ conversion rate $2.81½

Plioflex (Goodyear) (fasUSport US Cents per lb.)

1006 Hot, Non-Pigmented	23.25
1500 Cold, Non-Pigmented	23.25
1502 „ „	23.25
1703 Cold, Oil-Extended	20.00
1710 „ „	18.25
1712 „ „	18.25
1713 „ „	16.9
1714 „ „	16.65
1773 Cold, Oil-Extended, Light-Coloured	20.00
1778 Cold, Oil-Extended, Light-Coloured	18.5

Polysar (Polymer UK) (e-sUK)

S Hot	22
S630 „	22
Kryflex 200 Cold, for Cables	23.5
Krylene „	22
Krylene NS „ Non-Staining	22
Krynol 651 „ Oil-Extended	17.5
Krynol 652 „ „	17.75
SX 371 Process Aid	24

Synpol (Texas-U.S. Chemical Company) (cifUKdp)

1000 Hot, Non-Oil	23.10
1001 „ „	23.10
1002 „ „	23.34
1006 „ „	23.20
1007 Hot, Non-Oil	23.20
1009 „ „	23.71
1012 „ „	23.24
1061 „ „	23.10
X-274	25.32
8000	23.94
1500 Cold, Non-Oil	23.10
1502 „ „	23.10
1551 „ „	23.10
1703 Cold, Oil-Extended	20.13
1707 „ „	18.71
1708 „ „	18.71
1711 „ „	18.62
1712 „ „	18.48
8200 „ „	18.71
8201 „ „	17.20
8150 Cold, Black Masterbatch	19.46
8253 Cold, Oil and Black Masterbatch	16.20
8254 Cold, Oil and Black Masterbatch	15.83
8256 Cold, Oil and Black Masterbatch	16.33

US/£ conversion rate $2.80

SBR LATICES

Copo (Copolymer) (cifUKdp)
(10-ton lots)

2101 (dry weight)	46.30
X-765 („ „)	40.80
X-800 („ „)	37.20
2102 („ „)	38.00
2105 („ „)	38.00
2110 („ „)	38.00

Naugatex (Naugatuck Chemical International) (ex-wUK)

2000	39
2001	39
2002	39.5
2006	43
2105	40
2107	40
2108	40
2711	39
2714	39
2733	39
2740	43

Pliolite Rubber (Goodyear) (d)

2000	40

Latex

2001 (dry weight)	40
2104 „ „	40
2105 „ „	40
2108 „ „	40
5350 „ „	40

Pliolite Resin (Goodyear) (d)

101A (dry weight)	44
150 („ „)	50
151 („ „)	35
160 („ „)	50
170 („ „)	50

Hycar (B. F. Goodrich) (ddp)

2507 (high styrene) dry weight	48

Polysar (Polymer UK) (e-sUK)

Latex, type II	38.5
Latex, type IV	32.5
Latex, type 721	33.5

International Synthetic Rubber Co. (ex-wks)

Intol Latex R23	22
Intol Latex M23	22

ACRYLONITRILE TYPES

Butaprene N (Firestone) (cifUKdp)

NL	52.5
NAA	56.25
NF	51.5
NXM	60.18

Chemigum (e-s)

N—1	75
N—3A	52
N—5	52
N—6G	45
N—7	45
N—8	45
N600X	45

Hycar (British Geon) (500-lb. lots and over)	(UKd)
1001 High Nitrile Hot	52
1041 „ „ Cold	52
1002 Medium High Nitrile Hot	45
1042 „ „ „ Cold	45
Hycar (B. F. Goodrich) (500-lb. lots and over)	(ddp)
1411 High Nitrile (powder)	66
1432 Medium High Nitrile (crumb)	64
1072 Medium High Nitrile (carboxyl)	66
1312 Medium High Nitrile (liquid)	55
1043 Medium Low Nitrile	51
1014 Low Nitrile	61
I.C.I. (min. 5-cwt. lots)	(UKd)
Butakon A-4051 High Nitrile Cold	52
Butakon A-3051 Medium Nitrile High Mooney Cold	45
Butakon A-3002 Medium Nitrile Low Mooney Cold	45
Paracril (US Rubber)	(e-sUK)
18-80 Low Nitrile	63
AJ „ „	50
B Medium Low Nitrile	51
BJ „ „ „	51
BLT „ „ „ Cold	51
BJLT „ „ „ „	51
C Medium High Nitrile	59
CLT „ „ „ Cold	59
CV „ „ „(crumb)	60
D High Nitrile	67
ALT	51
Polysar (Polymer UK)	(d)
Krynac 800 Medium Nitrile	45
Krynac 802 Low „	45
Krynac 803 Medium „ (low Mooney)	45
Krynac 801 High Nitrile	52

ACRYLONITRILE LATICES

Butaprene N (Firestone)	(cifUKdp)
N-300 (dry weight)	53
N-400 („ „)	60.5
Chemigum Latex (Goodyear)	(d)
200 (dry weight)	65
235 CHS („ „)	60
236 („ „)	60
245 B („ „)	52
245 CHS („ „)	52
246 („ „)	52
247 („ „)	52
248 („ „)	52
Hycar (B. F. Goodrich) (dry weight, 3 drums and over)	(ddp)
1551 High Nitrile (large particle)	66
1552 Medium High Nitrile (large particle)	57
Hycar (British Geon) (dry weight, 3 drums and over)	(UKd)
1561 High Nitrile	60
1571 „ „ (carboxyl)	60
1562 Medium High Nitrile	52
1577 „ „ „ (modified)	

ACRYLIC TYPES

Hycar (B. F. Goodrich)	(ddp)
4021 Slab, 500 lb. and over	144
4501 Latex, dry weight	96

BUTYL TYPES

Esso	(e-sUK)
Regular 035	21.75
Regular 150	21.75
Regular 215	21.75
Regular 217	21.75
Regular 218	21.75
Regular 325	21.75
Non-staining 065	22.75
Non-staining 165	22.75
Non-staining 265	22.75
Non-staining 267	22.75
Non-staining 268	22.75
Non-staining 365	22.75

Vistanex (Polyisobutylene)	(e-qdp)
MS Low molecular weight	54
MH „ „ „	54
L-80 Medium molecular weight	54
L-100 „ „ „	54
L-120 „ „ „	54
L-140 „ „ „	54
Polysar (Polymer UK)	(e-sUK)
Butyl 100	21.75
Butyl 200	21.75
Butyl 300	21.75
Butyl 301 (non-staining)	21.75
Butyl 400	21.75
Butyl 101 (non-staining)	26.25
Butyl 402	22.5
Hycar (B. F. Goodrich) (500 lb. and over)	(ddp)
2202 Brominated	68

NEOPRENES

	(e-qdp)
W and WHV (dry weight del)	42.62
WRT („ „ „)	48.37
WX („ „ „)	44.62
GN („ „ „)	44.62
GNA („ „ „)	44.62
GRT and S („ „ „)	45.62
AC („ „ „)	57.125
KNR („ „ „)	75.62
AC'M'and'S' („ „ „)	57.125
CG („ „ „)	57.125
AD („ „ „)	57.125
Latices—Dry (per lb. del, min. 50 lb.)	
571	49.75
842A	49.75
572	51.25
601A	51.87
650	54.125
735	51.25
736	51.25
950	58.25
60	51.87
750	51.25
635	53.62

SILASTOMER

Midland Silicones (500 lb. lots del)	
Stocks	16s. 6d. to 35s.
Pastes	26s. to 35s.
Gums and base stock	36s. to 42s.
Cold-curing silicone rubber	20s. and 23s. 6d.

REINFORCING RESINS AND RUBBERS

I.C.I. (min. 2-ton lots)	(UKd)
Butakon S-8551	36.5
Butakon S-7001	33.5
Hycar (B. F. Goodrich)	(ddp)
2007 (powder)	42.5
Pliolite (Goodyear)	(d)
S—6B	36.5
Polysar (Polymer UK)	(e-sUK)
SS-250 (high styrene) (bale form)	27.25
SS-250 („ „) (flake form)	27.5
Kryflex 252 (high styrene)	25.5
Cyclite (Durham Raw Materials)	42

HYPALON

In 50-lb. bags del UK	71.62

Two well-known steamers belonging to British Railways and the British Transport Commission are being equipped with Dunlop inflatable life-rafts. They are the 'Hibernia' and the 'Cambria,' which sail between Holyhead and Dun Laoghaire. Both will carry twelve of the company's 20-man Seafarer rafts.

Patent Specifications

The following information is prepared from published Patent Specifications. The full Specifications can be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 3s. 6d. per copy (including postage).

Rubber Compositions

No. 808,289. The Firestone Tire and Rubber Co. Application and Filed, February 7 1956. Application in USA, July 28 1955. Published, February 4 1959.

Vulcanizable rubber compositions comprise natural or synthetic rubber containing particles of a previously vulcanized rubbery polymeric material, the proportion of the vulcanized particles being 100 to 400 parts per 100 parts of the rubber forming the matrix. The size of the particles is preferably such that 100% will pass through screens of 4 to 16 mesh and the shape of the particles is substantially prismatic. The compositions are intended for tyre chafers as they are resistant to flow during vulcanization and so prevent the chafer fabric from becoming exposed during vulcanization of the tyre.

Pneumatic Safety Tyre

No. 808,481. Dunlop Rubber Co. Ltd. Inventor: J. Wright. Application, November 18 1954. Filed, November 1 1955. Published, February 4 1959.

A pneumatic safety tyre assembly comprises two tyres of the kind described in Specification No. 786,162 (*RJIP*, February 22 1958, page 308), both seated on a common wheel rim and one fitting within the other to provide an air space between them. The safety tyre assembly is particularly valuable for use on carrier-based aircraft since an impact-burst on deck-landing can have disastrous consequences. In this case, the outer tyre may be inflated to an order of 100 psi to satisfy all normal operating loads while the inner tyre may be inflated to a greater value, say 200 psi, to prevent the outer tyre from becoming crushed between the wheel and deck in a heavy landing. Both the tyres have separate inlet connections and valves. The invention is also applicable to tyres for road vehicles and in this case the inner and outer tyres may intercommunicate. The inner tyre only is then provided with an inlet connection and valve in the manner used for the well known dual-chamber tubes.

Shorter Abstracts

Ethylene Polymerization. 806,649. Imperial Chemical Industries Ltd. Filed, November 9 1956.—Alpha-substituted acyl peroxides of a specified general formula are used as catalysts for the polymerization of ethylene at pressures greater than 500 atmospheres and temperatures above 10°C.

Blowing Agents. 807,405. Whiffen and Sons Ltd. Filed, September 11 1956. — Nitrosoalkylene ureas are claimed as blowing agents for rubber and plastics.

Rubber Markets

LONDON

The recent sustained advance in rubber prices gathered momentum during the past week and further widespread gains of around 1¼d. per lb. have been recorded. The Spot is well over a penny per lb. higher at 29½d. per lb., the highest level reached for over two years. Buying has not been heavy but sellers have been reserved and there has been a certain amount of short covering in progress. The strength of the market mainly reflects the generally optimistic outlook and the belief that future supplies are likely to be tight.

Latest prices are as follows:

No. 1 RSS Spot: 29d.-29¼d.

Settlement House:

June 29⅛d.-29⅜d.

July/September 29⅜d.-29⅝d.

October/December 29⅝d.-29⅞d.

January/March 29¼d.-29½d.

April/June 29½d.-29⅝d.

No. 1 RSS cif basis ports:

May 29d.-29¼d.

June 29d.-29¼d.

Godown:

May 100 Straits cents nominal.

Latex

Centrifuged latex per gallon in drums, May/June shipment, 17s. seller, cif European ports. Spot, seller, 17s. 5d. Bulk, seller, 17s. Creamed, seller, 16s. 8d. Normal, 38%, seller, 12s. 11d.

AMSTERDAM

The Amsterdam rubber market ruled as under on April 27:

	Guilders per kilo	
No. 1 RMA	April 27	Previous
April	Deleted	2.73½
May	2.73½	2.73½
June	2.73½	2.73½
April/June	Deleted	2.73½
July	2.77	2.77
August	2.77	2.77
September	2.77	2.77
July/September ..	2.78	2.78
October	2.77½	2.77½

Sales: 45. Tendency: Quiet

DJAKARTA

Values held steady and buying interest remained good for ready and nearby delivery rubber on April 27.

	Rupiahs per kilo	
	April 27	Previous
Spot No. 1 Priok ..	25.90b	25.75b
Spot No. 2 Priok ..	25.15b	25.00b
Spot No. 3 Priok ..	23.85b	23.75b
No. 1 fine pale crepe ..	24.25b	23.90b

Tendency: Steady.

BANGKOK

No. 1 RSS

The price for No. 1 RSS, at Bangkok on April 27 was 31.37½ (30.87½) US cents per lb.

NEW YORK

The New York rubber market ruled as under on April 27:

Dealers' Prices

	US cents per lb., ex-dock April 27
No. 1 RSS, May ..	34b —34¼a
June ..	34b —34¼a
No. 2 RSS, May ..	33½b—33¾a
June ..	33½b—33¾a
No. 3 RSS, May ..	33½b—33¾a
June ..	33½b—33¾a
No. 1 RSS, Spot ..	34b —34¼a
No. 3 amber blanket crepe, July	32¼b—32¼a
No. 1 latex, thin crepe, May	33¼n
No. 1 latex, thick crepe, May	33¾n

Futures—Rex Contract

	US cents per lb.	
	Close	Prev. Close
May ..	34.05t	34.40t
July ..	34.25t	34.45b-34.60a
Sept. ..	34.15t	34.25b-34.35a
Nov. ..	34.00b-34.05a	34.15b-34.20a
Jan. ..	33.90b-34.05a	34.05b-34.10a
March ..	33.90t	34.00t
May ..	33.90t	33.90b-34.00a

Sales: 99. Tendency: Steadier.

Rubber futures were easier on scattered commission house liquidation in moderate to fair dealings on April 27, reflecting the slow factory offtake and the lack of indications of any break in strikes at the Goodrich, US Rubber Co. and Firestone tyre plants. Shipment offerings were priced much too high above the market here and dealers were reluctant to touch them.

Synthetic Rubber

The following prices ruled in New York on April 22:

	Cents per lb.	
	April 22	Previous
GR-S, fas New Orleans	23.25	23.25
Neoprene GN, fob Louisville	41	41
Neoprene W, fob Louisville	39	39
Butyl, fas New Orleans ..	23	23
Paracril, fob Baton Rouge	50	50

CEYLON

No. 1 RSS

The price for No. 1 RSS, spot, at Colombo on April 27 was 123 (124) Ceylon cents per lb.

SINGAPORE

After opening slightly lower on April 27, the market ruled quiet and little change in values was registered. There was some selective interest in lower grades, sellers offering rather more freely. The afternoon was quiet and sellers were much more inclined to meet the market. Values closed at the day's lowest. The market ruled quiet in after-hours trading.

	Straits cents per lb., fob Malayan ports to open ports	
	Close	Previous Close
No. 1 RSS, May ..	97½—97¾	98 —98¼
June ..	97½—98	98¼—98½
No. 2 RSS, May ..	96¼—96½	97 —97¼
No. 3 RSS, May ..	95½—96	96 —96¼
No. 4 RSS, May ..	94¼—94½	94½—95¼
No. 5 RSS, May ..	92½—93¼	93¼—94
No. 1 RSS, Spot ..	97⅜—97½	97½—98¼
No. 3 blanket, thick remilled, May ..	91¼—93¼	91¼—93¼
No. 1 fine pale crepe, May ..	101—102	101—102
2x thin brown crepe, May	94¼—95¼	94 —95

Tendency: Quiet

The Industrial Syndicate quote latex, native produce, 60% centrifugal, packed in rec. drums fob at 193.20d. per gallon.

Trade Commission Moves

A change of address for three UK Trade Commission offices is announced. Details are as follows:

The Sydney Trade Commission moves into new offices on May 9 1959. The new office address is: London Assurance House, 16 Bridge Street, Sydney, Australia. Telephone No. 27-7521. The telegraphic address, 'Combritto Sydney,' will remain unchanged.

The Singapore Trade Commission has moved to Office of the United Kingdom Trade Commission, 5th Floor, Union Building, Singapore, 1. The P.O. Box No. 620; telephone nos. 20371, 22944; and telegraphic address, 'Britradcom, Singapore,' will remain unchanged.

The Kuala Lumpur Trade Commission has moved to 9th Floor, Police Co-operative Building, 1 Suleiman Road, Kuala Lumpur, Malaya. The telephones (81901, six lines), the box number (P.O. Box 577), and the telegraphic address ('Uktradcom, Kuala Lumpur') will remain unchanged.

More Natural to Japan

Japanese consumption of natural rubber would rise by 10% this year, the chairman of the Tokyo Rubber Exchange, Mr S. Ishikawa, said in Singapore.

This would bring it up to 150,000 tons annually, he said, 80% of which would be bought in Singapore.

Mr Ishikawa is in Singapore to talk to dealers about complaints that rubber shipments to Japan have not been up to specification. 'I hope this matter can be smoothed out,' he said. Japan would still buy natural rubber from Malaya, even though it was setting up more synthetic plants of its own. He warned against the danger of natural rubber prices going too high.

Mr J. A. Downes has been appointed a director of United Sumatra Rubber Estates and of Sumatra Para Rubber Plantations.

Industry INTELLIGENCE

Technical Data

Stabilizer N4

Stabilizer N4 is a mixture of polyethenoxy condensates of fatty alcohols and is a waxy solid of m.pt. 45°C. It is an effective material for the stabilization of latex compounds, a quantity ranging from 0.2 to 1.0 phr being normally used. Results of experiments on the use of Stabilizer N4 are given in Report No. 141/R/59, issued by the Anchor Chemical Co. Ltd., Manchester 11.

Two series of latex compounds were used, both being of the pure gum type. In the first series, the base mix contained 1.0 phr of an ultra-accelerator, and compounds containing 0, 0.25, 0.5 and 1.0 phr of Stabilizer N4 were prepared and tested for viscosity change on storage. The compound containing no stabilizer increased rapidly in viscosity and had coagulated within 12 hours, whereas the compound containing 1.0 phr of Stabilizer N4 was still fluid after 9 days' storage and showed very little increase in viscosity during this period. The second series of tests was designed to show the protection afforded by Stabilizer N4 in compounds containing heat-sensitizing gelling agents, ammonium nitrate being used as the gelling agent in a proportion of approximately 3 phr. Compounds containing 0, 0.05, 0.1, 0.2, 0.3, 0.5 and 1.0 phr of Stabilizer N4 were prepared and were tested for viscosity change on storage. The addition of 0.2 phr of Stabilizer N4 gave excellent stability for at least a week with scarcely any increase in viscosity. In spite of the greater stability of the compounds containing Stabilizer N4, the presence of this material does not result in any difficulty when the heat-sensitized compounds are used, *e.g.* for the manufacture of dipped articles.

Stiffener DSC

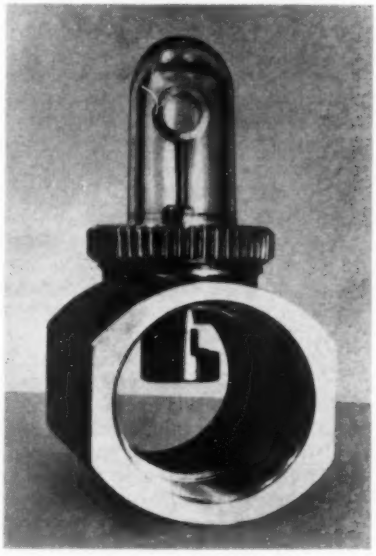
Unvulcanized compounds of oil-extended SBR and of natural rubber containing an appreciable amount of oil incorporated during mixing can be stiffened by addition of Stiffener DSC. The use of small proportions of this stiffener in both SBR and natural rubber compounds containing oil is described in Report No. 142/R/59, issued by the Anchor Chemical Co. Ltd., Manchester 11.

Krynol 651 was the oil-extended SBR used in this work and the mix contained 50 phr of Dixie 60, an HAF black. Small additions of Stiffener DSC produced stocks with increased Mooney viscosity and greater resistance to collapse in open steam curing. For example, addition of the stiffener resulted in an increase in the Mooney viscosity (ML–4—100°C.) from 43 (no stiffener) to 55 (0.25 phr of Stiffener DSC). The stiffening did not appear to be progressive with time. The natural rubber compounds contained 47.5 phr of Dixie 45, a GPF black, and the effect of a small addition of Stiffener DSC was investigated in compounds with and without the addition of the 10 phr of rubber process oil. Stiffener DSC increased the Mooney viscosity of the compounds and there was evidence of some progress stiffening with time of the natural rubber compounds without oil. The addition of the stiffener had no significant effect on the properties of the vulcanized SBR or natural rubber.

Machines, Materials and Equipment

Variable Flow Indicator

Demand on the part of many customers has urged Walker, Crosweller and Co. Ltd., Cheltenham, to extend the range of their Arkon variable flow indicators. These instruments can be adjusted for high or low velocities of flow and now include sizes 1¼in., 1½in.



and 2in., in addition to ¼in., ½in. and 1in. The principle of cartridge construction, as applied in these Arkon instruments, has met with immediate acceptance in preference to other methods. With Arkon indicators the complete cartridge assembly is interchangeable between the different sizes. The spindle impeller assembly, which is fitted in a cartridge housing, is easily removed and reset for the required flow range. The Arkon indicator itself is simple and reliable and shows at a glance whether flow is taking place. A chromium-plated ring at the top of the spindle under a toughened glass dome stops spinning if the flow stops. Arkon variable flow indicators are used to indicate the flow of water, lubricating oil, cooling oil, and other liquids.

Publications Received

Silicone-Glass Laminates

Latest in the series of 'Silicone Notes' booklets published by Midland Silicones Ltd., is entitled 'Silicone-Glass Laminates.' It describes the properties and applications of silicone resin-bonded glasscloth laminates. The booklet is a complete revision of an earlier edition and has been re-written and re-styled in an attractive format with new and interesting photographs.

Silicone-glass laminates are made of either continuous filament or staple fibre glasscloth bonded under heat and pressure with a silicone resin. They are produced as flat sheets in thickness from .012in. to 3in., as tubes, or, by using a low-pressure silicone laminating resin, in complex shapes such as ducts and radomes. Silicone resin pre-impregnated glasscloth is available for use by firms not possessing impregnating equipment.

PVS Reagents

The 'AnalaR' series of laboratory chemicals manufactured by Hopkin and Williams Ltd., Chadwell Heath, Essex, includes a number of substances that assay over 99.9% and which are recommended for use as volumetric standards. There is, however, an important demand for reference standards intended for the most highly-critical work as, for example, when agreement between collaborating laboratories has to be established in terms of the second decimal place. To meet such requirements, the company is now offering a series of chemical substances purified to an ultimate degree for this special purpose. These are presented in the company's publication 'PVS Reagents Purified for Volumetric Standardization.'

Plastic Tooling

Basic details of the use and possibilities of Double Bond Toolform are contained in a new illustrated leaflet published by The Kenilworth Manufacturing Co. Ltd. The Double Bond Toolform range consists of epoxide plastics in a new pre-mixed, colour coded form for easy choice and application to a variety of tooling work. Copies of the folder, and other technical information are available from The Kenilworth Manufacturing Co. Ltd., Hermetite Works, West Drayton, Middlesex.

BPF JUBILEE LUNCHEON

Continued from page 678

Sir Cyril said that during the war he had the privilege of working with Air Chief Marshal Sir Wilfred Freeman, to whose determination both before and during the war to foster research and development in the aircraft field the country owed so much.

'As a result of this the quality of our equipment enabled us to survive against much larger and superior numbers,' said Sir Cyril. 'He once said to me that when I was investing my money I should invest it in those firms and industries which devoted a large proportion of their resources to research and development.

Pursuit of New Discoveries

'I would go further and say that the thought behind this advice is really of national importance. In a country such as ours economic prosperity, perhaps even economic survival, depends upon the pursuit of new discoveries and their proper commercial exploitation.

'Your industry has discovered an amazing number of new materials and has increased its output in the staggering manner your chairman has mentioned because of these achievements, one of our great national assets.

'I think I can claim that my old department, the Ministry of Supply is worthy to be mentioned in this connexion in the same breath as your industry, for since the war the Ministry of Supply's predominant purpose has been the pursuit of scientific developments leading up to the acquisition of new knowledge in many spheres, and to improve products and techniques. In this respect it has followed the plastics industry.

Failures and Successes

'But in consequence, as a Government department, it is subject to criticism for failures and little praise for success. No doubt you have had your failures—but the outside world knows little of them.

'If I am right in assuming that you have had failures I would say it is to your credit that you have not been deterred. You in this industry have neither failed to try nor failed to succeed and for that reason deserve the thanks of us all.'

'Babies' Pants'

Sir Cyril said it was interesting to speculate about how boffins in the plastics industry went about their tasks. He had only the Federation's 1958 report to go on and in that he read that consideration had been given to the economical thickness in specifications for baby pant materials.

To him this conjured up the vision of rows of scientific gentlemen, each with a baby on his lap, putting on each of them prototypes of various kinds of baby pants—' and presumably leaving these babies so clad for a carefully scientifically calculated period of time, and then, of course, conducting humidity and other tests.

'I like to think the chairman and managing directors of plastics firms whom I see around me perhaps lend a hand in these experiments.'

He had also read that during the year work had begun—he assumed in the same laboratories—on specifications for polythene bowls, other than round, and other baby baths. An association of ideas had led him to the conclusion that the NSPCC should have its attention drawn to the fact that the industry appeared to be experimenting with pots for babies other than round. 'It really seems that this is carrying experimentation too far,' he said. 'It may even lead to distortions . . . in the coming generation.

Reaching Maturity

'I find evidence, also, in the wording of these passages from your report that this industry of yours, although it is usually described as a new industry, or one of them, is really reaching maturity. Indeed, its phraseology is beginning to resemble that of so mature an institution as a Government department.

'When I read that consideration has been given to the economic thickness, etc., I feel nostalgic and I am once again back in a Government department looking at the draft of an answer to a Parliamentary question and when I read of polythene bowls other than round I am looking at an inventory for army equipment.

'It is right that you should take the phraseology of maturity for you have "arrived." As the Chairman said, it is difficult, if not imposssible, to think of any sphere of human endeavour in which plastics do not now play a part. As I implied earlier, the growth of your industry is not by any means due solely to the general industrial expansion of this country. New materials known as plastics are not being used solely in substitution for older types of materials. Several things we now use I believe would not succeed if plastics had not been invented.

'While I am honour bound to deprecate the substitution of plastic materials for steel where it is a clear substitution, I doubt whether on balance old materials suffer adversely because of the advent of these new materials.

'When we are looking at the effects of competition one should take a broad view. Competition is good for both,' said Sir Cyril, who spoke of the 'fruits of the marriage of two industries in plastic-coated steel sheets.'

Possible Speakers

He then referred to the Federation's partiality towards guest speakers whose names began with the letter 'M,' and suggested that the Committee had a wide choice for next year —Mr Mintoff or Archbishop Makarios from the Mediterranean; at home Molson, Marples, Maudling—' and someone I believe called Macmillan'; while Mr Malenkov or Mr Molotov might even be available.

'But perhaps having listened to me you will think the most proper speaker next year would be one of the Marx Brothers.

'Mr Chairman, on behalf of all your guests I thank you most warmly for your hospitality and good company this afternoon.'

Mr C. H. Glassey said he felt honoured to speak for the first time as president of the Federation. There was a lot he would have liked to say, but the occasion was not appropriate. He went on to express thanks, on behalf of all members present, to Sir Cyril Musgrave for his presence and his remarks on the industry.

Polymeric Progress

A two-day conference on 'Polymeric Progress,' organized by the Plastics Institute, will be held in the William Beveridge Hall of London University on March 30 and 31 1960. The first day's proceedings will open with a one-hour paper on 'New Polymers: New Problems' by Professor H. F. Mark, from the Polytechnic Institute of Brooklyn. The remainder of the first day will be devoted to Materials and the second day will be concerned with Methods—present and future—of polymerization. Contributions will be made by other leading authorities from USA, Germany, Italy and the UK.

NR Prices Up

Spot rubber on the London Natural Rubber Market on April 29 rose a further 1¼d. to 2s. 5¾d. per lb., the highest level reached since January 1957.

Mambau (FMS) Rubber announce the acceptance of a £128,450 offer for their estate. The offer is subject to contract, shareholders' approval and Treasury consent.

Voluntary Liquidation

Dahan Rubber Estates Ltd., 19 Eastcheap, London, E.C.3.

Meetings of shareholders and creditors of Dahan Rubber Estates Ltd., a public company with an authorized share capital of £75,000 in shares of 2s. each, of which £66,557 10s. had been issued, were held recently in London, when resolutions were passed confirming the voluntary winding-up with Mr Kenneth R. Cork, F.C.A., of 19 Eastcheap, London, E.C.3, as liquidator.

Mr Cork said that as liquidator of Mias (Holdings) Ltd. (in compulsory liquidation), he held a very large block of the share capital of Dahan Rubber Estates Ltd. He added that following the sale of the company's interests in Sarawak, the company was in funds in August 1958 to the extent of about £39,000, but during that month there was a series of transactions which it was very difficult to elucidate. It appeared it was intended to buy from Mias (Holdings) Ltd., another company which was supposed to own three subsidiary companies. The value of those companies was supposed to amount to £35,000, and at least one cheque for that sum was drawn by Dahan Rubber Estates Ltd. and was ultimately debited to the company's bank account. From subsequent investigations it was apparent that the other company did not and had never owned the three subsidiary companies.

The statement of affairs showed there were unsecured liabilities of £774. Assets totalled £3,925, and after allowing £2,537 due to debenture holders there were net assets of £1,388, subject to the costs of liquidation.

Mr Cork said that having regard to several transactions it was felt that the fullest investigation should be carried out with a view to recovering as much as possible for the creditors and shareholders. He added: 'I am hoping that action will be taken to get the company's money back. I am sure creditors will be paid in full, and I am hoping that something will become available for the shareholders.'

Latest Wills

Mr Arthur Thomas Stokes, of Sandford Road, Old Newton, Suffolk, formerly a rubber planter in Malaya, who died on January 18 last, left £830 gross, £759 net value.

Mr Marcus Claude English, of Holt House, Earls Colne, Essex, director of a number of plantation companies, including Kuala Lumpur Rubber Co. Ltd., Tanjong Malim Rubber Estates Ltd., and Jeram Rubber Estates Ltd., who died on November 15 last, left £25,157 gross, £19,892 net. (Duty paid £3,566.)

Changes of Name

Celanese Plastics Development Ltd. (375,032), 'Celanese House,' 22/3 Hanover Square, London, W.1. — Name changed to Prinex Ltd.

PATENT LIST

Printed copies of the Specifications in the following list can be obtained from the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d., including postage, but about six weeks after the date of this publication will usually elapse before they come available. Orders with remittance may be sent in advance to the Patent Office, and will be fulfilled immediately the Specifications are published.

COMPLETE SPECIFICATIONS ACCEPTED

Open to public inspection on April 22 1959

Goodyear Tire and Rubber Co. Laminated conveyor and other belting. 812,458.

Imperial Chemical Industries Ltd. Production of polymers. 812,176.

Union Carbide Corporation, formerly Union Carbide and Carbon Corporation. Polymeric phosphate esters and their production. 812,390.

Zenith Plastics Co. Radar reflectors. 812,384.

Rohm and Haas Co. Linear copolymers. 812,140.

Hosking Patent Corporation. Check valves, more particularly for tubeless tyres. 812,373.

O. Gruber and W. Gruber. Patches for rubber and rubberized articles. 812,172.

Dunlop Rubber Co. Ltd. Apparatus for making pneumatic tyres. 812,155.

Velsicol Chemical Corporation. Epoxide ether, polymerization products thereof, and their preparation. 812,374.

Rohm and Haas Co. Amides of vinyl ethers containing hydroxyl groups and polymers thereof. 812,158.

Phillips Petroleum Co. Polymerization process and catalyst therefor. 812,165.

United States Rubber Co. Automatic rubber moulding machine. 812,452.

British Sidac Ltd. and A. Copple. Moistureproof heat sealing cellulose films. 812,130.

Phillips Petroleum Co. Process for the production of solid polymers of ethylene and other olefin polymers. 812,139.

Open to public inspection on April 29 1959

B. F. Goodrich Co. Elastomers. 812,613.

United States Rubber Co. Isopropylidene bis (dichlorophenyleneoxy) dialkanols. 812,534.

Chemische Werke Huls A.G.—Process for the preparation of unsaturated polyester copolymers. 812,675.

Soc. des Usines Chimiques Rhone-Poulenc. Polymerization of ethylene. 812,515.

Union Carbide Corporation, formerly Union Carbide and Carbon Corporation. Process for the preparation of polybutadiene - styrene - acrylonitrile graft polymers. 812,808.

Dow Chemical Co. Process for preparing cellulose ethers and the product obtained thereby. 812,510.

Future Events

May 2—May 7

INSTITUTION OF THE RUBBER INDUSTRY

Golfing Society, Scottish Section.—Thursday May 7 at the Kelburne Golf Club, Largs. Scottish Challenge and Wallwork Qualifying Round.

London Section.—Tuesday May 5 at the Wellcome Foundation, 183 Euston Road, London, N.W.1, at 6.30 p.m. 'Precision Cast Moulds and Tools for the Plastics Industry,' by C. Shaw. By invitation of the London Section, Plastics Institute.

PLASTICS INSTITUTE

London and District Section.—Tuesday May 5 at the Wellcome Foundation, 183 Euston Road, London, N.W.1. Annual general meeting followed by 'Precision Cast Moulds and Tools for the Plastics Industry,' by C. Shaw.

Plastics and Polymer Group, Society of Chemical Industry.—Tuesday May 5 at the SCI Meeting Room, 14 Belgrave Square, London, S.W.1. Annual general meeting followed by the chairman's address, 'The Pursuit of Polymers,' by C. E. Hollis.

Western Section.—Wednesday May 6 at the Erinoid Clubhouse, Lightpill, Stroud, Glos, at 7.30 p.m. Annual general meeting.

EXHIBITIONS

National Education and Careers Exhibition, Olympia, London, May 26 to June 5.

National Industrial Safety Conference and Trade Exhibition, Scarborough, Yorks., May 8-10.

TRADE MARKS

Objections to the registration of any of the undermentioned applications may be lodged with the Comptroller-General of Patents, Designs and Trade Marks at the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, within one month of the date mentioned. The objections must be stated on Trade Marks Form No. 7, cost £2, obtainable through any money order office. The extracts—from 'The Trade Marks Journal'—given below are reproduced by permission of the Controller of H.M. Stationery Office.

PLASTOCHROME (778,636) For gloves and mittens, all for protection against accident or injury, and all being made of plastics or of textile materials impregnated or coated with plastics. By James North and Sons Ltd., Godley Mills, Hyde, Cheshire. (Class 9; March 25 1959.)

GLAMONA (782,513) For plastics in sheet form and included in Class 17. By Glamapak Ltd., 27 Knightrider Street, London, E.C.4. (Class 17; March 25 1959.)

POLYLINE (783,229) For clothes lines, ropes and cordage, all made from monofilaments of polythene plastics. By Plasticisers Ltd., 135 Skellow Road, Skellow, near Doncaster, Yorkshire. (Class 22; March 25 1959.)

Rubber Journal and International Plastics CLASSIFIED ADVERTISEMENTS

APPOINTMENTS VACANT

6d. a word, Minimum 10/- Box 2/-

A SENIOR and experienced rubber technologist is required by well-known makers of cellular rubber. Applicants should have an intimate knowledge of cellular rubber technology. For a high-class, qualified and ambitious applicant a commencing salary of up to £1,500 per annum and bonus is envisaged and assistance can be given towards house purchase. There is in addition a Top Hat pension and life assurance scheme. Applications in strictest confidence to:—Box 14. (14)

A VACANCY exists for a junior rubber technologist to work on development and process control in Manchester. L.I.R.I. standard. Aged 20 to 25 years. Apply to:—Technical Superintendent, Phillips Rubbers (Manufacturing) Limited, Dantzic Street, Manchester, 4. (396)

CHEMIST required with experience in compounding natural and synthetics and of process control. Several years' proved experience and A.I.R.I. or equivalent preferred.—Details in confidence to Long and Hambly, High Wycombe. (394)

ENGINEER-DESIGNER required for large manufacturing firm in the Manchester area. Experience of rubber and plastics plant and qualifications at least to O.N.C. desirable. Good opportunity for suitable applicant. Pension scheme. Please state experience, qualifications and salary required.—Box 13. (13)

EXPERIENCED rubber press-man, to operate four daylight sheeting press. Days, but must be prepared for shift work. North Manchester Area.—Box 22. (22)

LARGE rubber and plastics manufacturers in the East Midlands require a chief development officer, experienced in the design and development of new products and the engineering methods associated with this type of development. Good salary. Superannuation scheme and excellent prospects are offered to applicants, who should give full personal, commercial and technical particulars, in confidence to:—Box 20. (20)

LATEX chemist is required by Greengate and Irwell Rubber Co. Ltd. for their latex division at Melton Mowbray to take charge of routine laboratory and development in a rapidly expanding factory. Superannuation scheme; excellent prospects. Please reply in confidence to:—General Manager, Latex Division, Melton Mowbray, Leics. (18)

LATEX chemist, aged 25-35, required by progressive firm of compounders in Manchester area. Preference given to man with degree or other qualification. Write stating age, experience and salary required to:—Box 17. (17)

PLANT development and methods engineer required by established rubber company in close proximity to London. A knowledge of the latest types of tool design and mechanical presses essential. This is an excellent opportunity to join an expanding organization. A company house would be available to the successful applicant. Replies, in confidence, to:—Box 399. (399)

A large Electric Cable Company in the London area requires the services of a RUBBER TECHNOLOGIST with experience in natural and synthetic rubbers. A knowledge of the cable industry and plastics would be an advantage. This position affords an excellent opportunity of acquiring experience of modern cable-making technique both in the factory and in laboratories well equipped with modern pilot-scale plant, with a leading cable manufacturing company.—Reply in the first instance, giving brief details, to Box RJ.600, c/o 191 Gresham House, E.C.2. (9)

APPOINTMENTS VACANT

(continued)

TECHNICAL sales engineer required by progressive Midlands firm of synthetic rubber specialists, to expand sales of new material for engineering applications. Good prospects. Apply, giving full details of experience to:—Box 395. (395)

VACANCY occurs for young rubber technologist, having completed national service, of L.I.R.I. standard. Experience in footwear compound an advantage. This is an opening with good prospects. Applications, which will be treated with confidence, should be addressed to:—Sam Kay Rubber Co. Ltd., Hope Mill, Portwood Place, Stockport. (5)

ARTICLES WANTED

6d. a word, Minimum 12/6. Box 2/-.

WANTED rubber spreading machines, any condition.—Box 16. (16)

WANTED one 3-roll rubber calender 60in. x 24in., also hydraulic presses.—B. and J. Wright and Sons Succs. Buslingthorpe Lane, Leeds. (15)

WANTED second-hand laboratory mill also laboratory size jacketed vulcanising pan.—The Woodville Rubber Co. Ltd., Burton Road, Woodville, near Burton-on-Trent. (21)

ARTICLES FOR SALE (SECONDHAND)

6d. a word, Minimum 12/6 Box 2/-

SEVERAL hundred foam rubber pillow moulds (in three sizes) and seat cushion moulds, two water-extractors and washing machine available.—Box 11. (11)

TWO rubber spreading machines, excellent working condition, 60in. Robinson and 72in. Bridge.—Box 360. (360)

60IN. x 24in. 4-bowl even friction calender with 90 h.p. variable speed drive. 4½in. Iddon strainer extruder with 30 h.p. drive. 4 Carter high speed braiding machines.—Reed Brothers (Engineering) Ltd., Replant Works, Woolwich Industrial Estate, London, S.E.18. Telephone: Woolwich 7611/6. (10)

MISCELLANEOUS

6d. a word, Minimum 12/6 Box 2/-

AVAILABLE regular supplies 20^s/30^s/40^s mesh tyre crumb.—Box 385. (385)

COMPANY specializing in plastic proofing of industrial fabrics—P.V.C. polythene—would welcome co-operation with organization wishing to expand into this field of proofing.—Box 19. (19)

"COTSWOLD" dipping machines and circulating tanks for latex and PVC. New catalogues now available on request.—Lionel Hook and Sons, Ebley, Stroud, Glos. Tel.: Stonehouse 614/5. (380)

DESIGNS for rubber moulds, single or multi-cavity, executed accurately and quickly at reasonable cost (11s. 6d. per hour).—G. Busse, 50 Winchester Road, Kenton, Middlesex. Wordsworth 7972. (12)

MANUFACTURERS of roughing machines for rubber sheeting, sponge rubber, splitting machines, leather cloth plant, embossing plates and rollers, spreading machines and presses.—G. L. Murphy, Ltd., Imperial Works, Menston, Nr. Leeds. (238R)

SILICONE rubber moulding. Capacity available for prototype and repetition work.—Esco (Rubber) Ltd., 2 Stothard Place, Bishopsgate, London, E.C.2. (170)

SLITTING capacity available for tape production.—Phoenix Rubber Co. Ltd., 2k Buckingham Avenue, Trading Estate, Slough, Bucks. Tel. No. 22307. Grams: Phenrub, Slough. (54)